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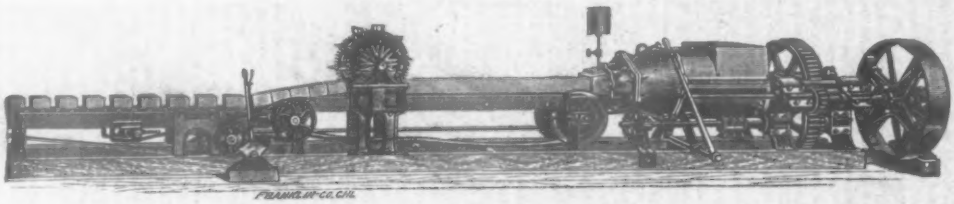

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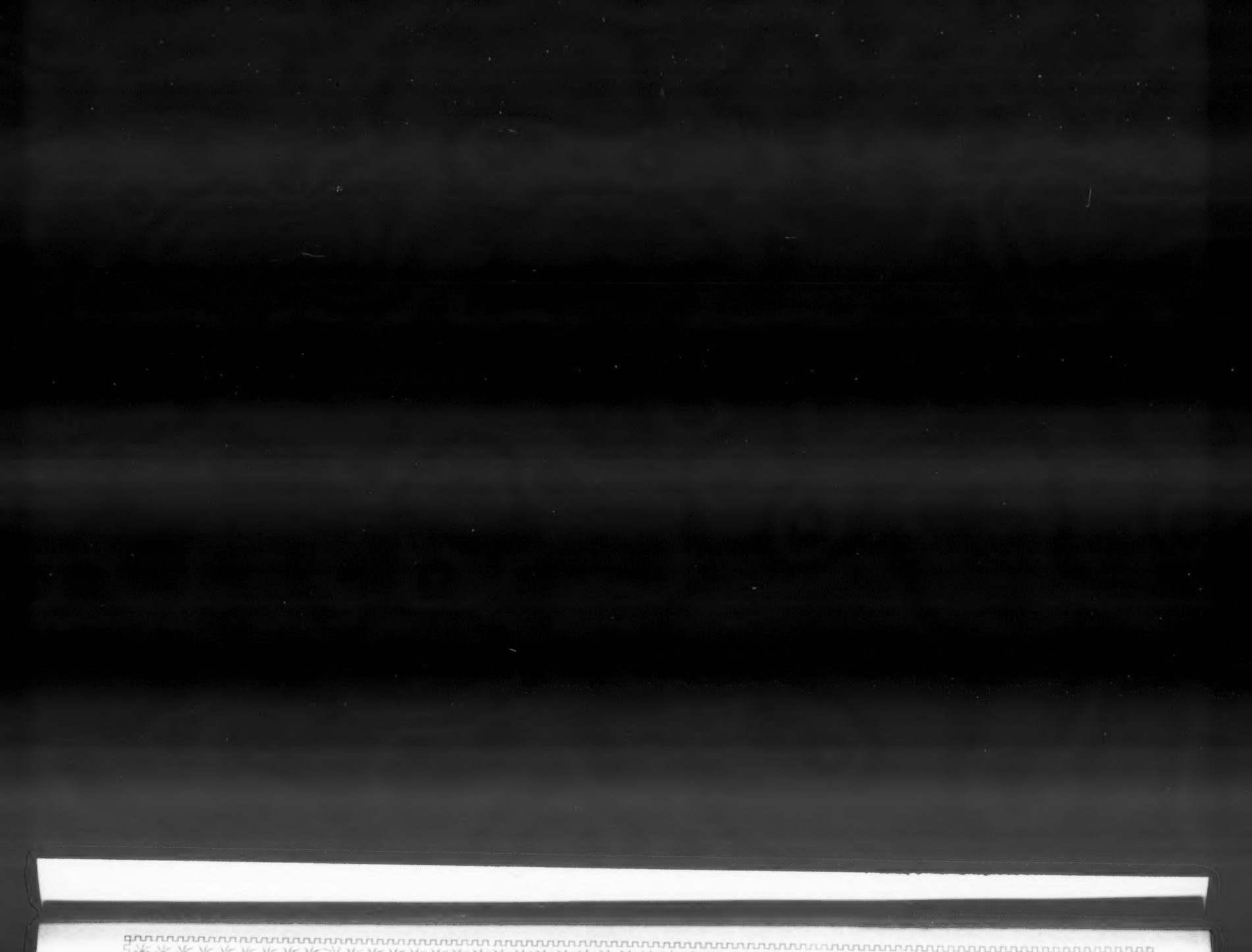
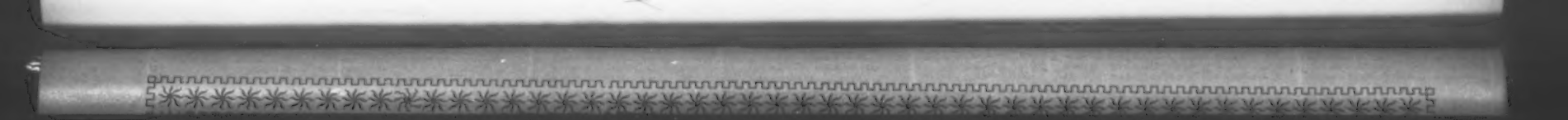




Paving and Municipal Engineering

VOLUME IX. NOVEMBER, EIGHTEEN NINETY-FIVE. NUMBER 5.

GENERAL SUGGESTIONS AS TO PARKS AND THEIR MANAGEMENT.

By Edward Hill, C. E.

A PARK properly constructed requires great skill and artistic taste, and the engineer into whose hands it is intrusted must possess ability of no mean order; he must, in fact, have a natural talent to create out of a chaotic mass or condition a living picture so near like nature with a refined finish, that the whole blends and harmonizes from every point of view. The perspective must be true, so that it appears as one vast panorama moving before the vision, without the least defect to mar the landscape. He must place mountains where no mountains exist; create the placid lake, sheltered by the drooping branches of the water-willow and the foliage of the sweet-scented shrubs growing along its banks, the running brook with its stepping-stones and the noisy waterfall striking the pool below it as if it had existed for ages, formed and placed there by some unknown process during the prehistoric formation of the earth. He must create the rocky precipice, the craggy dell, the mountain slope, embellished by the spreading fern, the lichen, the primula and the purple heather—the whole to be interspersed by well-kept boulevards and walks, laid out and adorned with grottos, fountains and flower-beds.

The location of a park is generally cause for much discussion in towns that are flat, as nature has not provided those essential features that are necessary for a beautiful landscape; hence the skill and ingenuity of the landscape engineer is taxed to its full capacity to produce a pleasing and satisfactory result. Some towns are more fortunate in being located where nature has done her share towards

producing a natural park or parks. The prime object, however, should be to utilize those lands for parks that are least suitable for anything else; and generally there are such lands near all large cities that present a very uncouth and objectionable appearance. Such lands transformed may cost much expense and labor, but it is money well spent, and will add to a city's benefits many times the cost of producing it. Parks afford a means of disposing of objectionable lands and making health resorts out of quagmires and sand hills. Care should be taken to locate where there is an abundance of water available and controllable, as no park is perfect without a lake or running stream.

Parks have many uses. In general they are recreation grounds, where people can walk, ride, drive or rest; they are considered public property, governed by a body of men chosen from the masses, under laws, ordinances and regulations specially drawn up for the guidance of the public using them. They afford means of placing institutions in them that are of vast importance to the inhabitants of a city, as all parks should be furnished with a museum, a building set apart for curiosities and art, systematically arranged for the inspection of the curious or the studious. We are constantly finding relics that have great value, and ought to be preserved for their historical worth. We ought to have a collection for naturalists, geologists, botanists, etc., in fact, a collection of everything that has an educational value, that can be cared for and preserved. Another institution is that of a gymnasium, where children can get outdoor exercise and physical development, affording a means of recreation that all children love and need. Another institution that is of great benefit to a city, where there is an abundance of water, is a public bath-house and swimming pond. From a sanitary standpoint European cities have long since learned that such bathing places are very beneficial, especially amongst the poorer classes, who have not the means of enjoying private baths.

Parks are repositories for statues of public men, works of art, specimens of geology, etc., and gifts generally of enterprising citizens who wish to be remembered in the future, and who have a desire for the welfare of a city, and to adorn at least one spot that the people in common can enjoy; they have a great tendency to make the inhabitants of a city happy and contented, and to take a just pride in its advancement.

THE FENS — COVE ON EASTERLY SIDE.

A Feature of Boston's Park System.

There is no general plan for parks. A plan for a park depends upon the shape and location of the land to be utilized for park purposes and the landscape engineer. He must work out a plan that will transform the land into a beautiful picture; he must pass it through a refining process. The landscape engineer has no set rules or formulas to guide him. He is left to his own resources. He must think out his own plans, and his success or failure depends upon his own genius and experience. He must study well the full scope of the work intended, and adapt and create a plan that will embody the uses for which the park is intended. If the park is an extensive one, his task is difficult and tedious, and will require a new feature at almost every stage of construction. He must be equal to every emergency and full of ideas, as the work of park construction requires him to be artist, engineer, skilled mechanic, naturalist, architect and contractor. He must see a finished picture. He must deal with elevations, curves, planes and solids, and a drainage system. All mechanical work he must thoroughly understand. He must deal with trees, flowers, minerals, bipeds, quadrupeds and the feathered tribe, design arches and buildings, and understand making and carrying out of contracts. It is very trying to perfect a park system, as it is of slow growth.

The first and foremost work in constructing a park is to thoroughly contour the land to be used and make a map of it. He must know exactly the elevations at all points in the field of operation. This will enable him to study closely the locations he has to deal with and determine a suitable place for any object or special feature he may wish to produce, whether it be fountain, lake, pavilion, walks or boulevards. He can plan from it a design in perspective, showing his ideas in such a tangible form that they are conveyed to others, thus presenting to his employers a plan of his scheme for discussion and approval. After this is done, details of any special construction, if it comes under the general rules of engineering, can be produced at will or as demanded.

It may be well to say at this time, that it would be almost impossible to put on paper details for the construction of a grotto, an artificial precipice, a lagoon, or a cavern, as they appear in nature, as these things exist in the imagination or mind of the landscape engineer, to be produced under his entire supervision, put together piece by piece, or shaped as his imagination dictates.

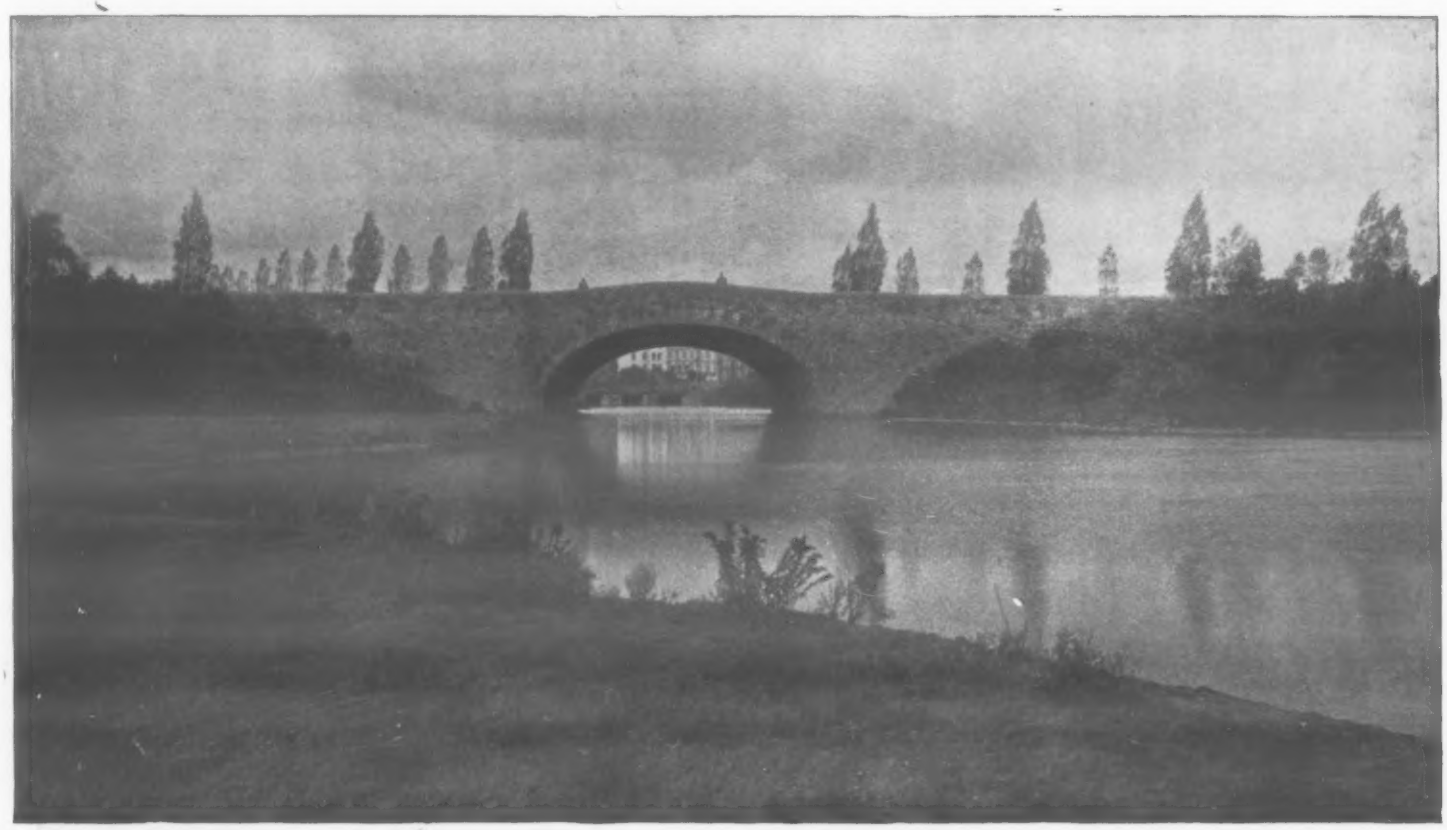
The actual management of parks is vested in a superintendent. He must be a florist, botanist and landscape gardener, possessing a wide knowledge of forestry and the laws of propagation, how to plant and cultivate the various kinds of forest trees, the nature of the soil best suited to each variety, and the location best adapted to their habits, as generally each variety is affected differently by climatic influences and requires special treatment. He should have a good knowledge of floriculture, as flowers and plants appeal to the sympathy and touch the finer feelings of human nature. He must understand the habits, growth and grouping of flowers and plants, as they play a very important part in park decorations and adornment; if they be exotics he must know the conditions under which they thrive in their natural state. He must be a landscape gardener in order to assist in perfecting the ideas and general plan of the landscape engineer. He is the person to whom the minor details of park construction is intrusted; it is he who puts on the finishing touch of the combined plans.

THE PARK SYSTEM OF BOSTON.

By Sylvester Baxter, Secretary of the Metropolitan Park System.*

Boston is famous among American cities for the beauty of its environing landscape. In beauty of location, in artistic design, in thoughtful adaptation to peculiarities of site, in development in a way to meet the widest possible requirements on the part of the public, as well as in variety and extent, the park system of Boston and its metropolitan vicinage, existing and projected, surpasses that of any other city in the world. In the metropolitan district the area of public reservations of various kinds for recreative and water-supply purposes amounts to something over 14,000 acres. This includes bodies of water inclosed by public lands, such as Fresh pond in Cambridge, and Spot pond in the Middlesex Fells, but does not include

*Condensed from the "Boston Park Guide," written by Mr. Baxter, and recently published by him. Copies can be obtained at the price of 25 cents each, by addressing him at No. 255 Washington St., Boston.



THE FENS—BOYLSTON BRIDGE.

such water areas as Charles river basin, the almost land-locked Pleasure Bay of Marine park, the Mystic lakes, or Lake Quannapowitt, in Wakefield, which are bordered on one side by park lands, and which also might be taken into account as recreative, public open spaces, with their facilities for boating, bathing, skating, etc.

The Boston parks may be divided into two systems; the municipal parks of the central city, and the parks of the metropolitan district and the suburban municipalities. Not including the historic Common and the more modern Public Garden, with the minor urban open spaces, the municipal system, administered by the Boston Park Commission, has a total area of over 1,300 acres, and up to date has cost something over $12,000,000 for lands and construction. The creation of the system was authorized by popular vote in 1875, and construction was begun in 1879. Not until 1887, however, did the improvement of the greater portion of the system begin. The parks are therefore still in their early stages of development, and in many portions years must elapse before the full beauty of their design becomes apparent. The design and general supervision of construction was at the start fortunately placed in the hands of Mr. Frederick Law Olmstead, and has remained with him and his associates.

The main distinctive characteristic of the Boston municipal system is its design as a series of parks, each possessing an individual landscape character and special recreative functions, united by a chain of drives, rides and walks, forming a grand parkway of picturesque type five miles in extent, reaching from the heart of the city into the rural scenery of the suburbs. This is a unique thing in park design. It has become enormously popular and gives access to four parks of remarkable beauty, for riders of bicycles and horsemen, as well for pedestrians and those driving in carriages from the business center. A similar parkway connection with the metropolitan parks to the southward, in extension of this chain, has been determined upon, and it is probable that like connections will also be made to the westward and northward. This chain of pleasureways and parks begins at the Public Garden in Commonwealth avenue.

This great avenue was designed by the late Arthur Gilman,

THE FENS — AGASSIZ BRIDGE.

architect, as the central feature in the plan of the Back Bay lands. It is celebrated as one of the stateliest urban thoroughfares in the world. It was named from the circumstance of being laid out over lands belonging to the Commonwealth of Massachusetts. It has a width of 200 feet, besides a reserved space of 20 feet between building line and sidewalk on either side, making a total width of 240 feet from house to house. There is a planted space with grass, trees and footway in the center, with macadamized roads on either side. It was incorporated into the park system from the Public Garden to the crossing of Beacon street, in 1894; the extension from Beacon street through the Brighton district to Chestnut Hill reservoir is in control of the street department, thence extending through the city of Newton to Charles river.

The Parkway is an irregular and comparatively narrow strip of roads, foot-paths and saddle-paths for pleasure purposes enclosing picturesque scenery, running something like five miles from Charles river near Harvard bridge to Franklin park, and, with Commonwealth avenue, making a continuous drive of about six miles from the heart of the city at the Public Garden, connecting and traversing Leverett park, Jamaica park and the Arnold Arboretum.

The Parkway is immensely popular, providing for Boston a great concourse for pleasure driving, riding on horseback and bicycle riding similar to those of the great capitals of Europe and that of New York in Central park, of Chicago in the Lake drive, and of Mexico in the Paseo. The five subdivisions have locally descriptive names, all with the common terminal of "way," with the exception of the first, which is called "Charlesgate"; "Fenway," "Riverway," "Jamaicaway," and "Arborway."

In general character the Parkway resembles the Festungs-Anlagen of various German cities, like Bremen and Leipsic, where the demolition of the ancient fortifications surrounding the old "inner cities" gave opportunity for creating pleasure grounds upon the open spaces thus left—the inequalities of surface made by the debris, together with the ditches that surrounded the walls, inviting picturesque forms of treatment in landscape and water surfaces. But the scale of the Parkway is far more extensive than any of its German prototypes. Like them, as we have seen, it originated in

the artistic handling of an important engineering problem, as the most practical and economic form of development. And with its opportunities for diverse forms of recreation by land and water, it has already become one of the most popular of Boston institutions. The Parkway is a line of communication for pleasure purposes, distinguished by picturesque and continually varying scenery, with water-courses as the central feature for the greater part of its length, and furnishing the leading motive of the design, the space here and there expanding into genuine parks. The remarkable delicacy of artistic perception which has guided the design of the Parkway is manifest in the way in which the successive sections form natural steps in the gradual development of scenic changes from the maritime, marshy character of the Fens to the rural and pastoral New England aspect of Franklin park. The lower basin of the Fens, for example, is of the purely salt-marsh type, while the upper basin, with its frequent islets and more prominent bits of upland, recalls the landscape of the more inland reaches of marsh scenery on the coast.

The Charlesgate is the first section of the Parkway, between Charles river and Boylston road. It is so called from the watergate connecting the overflow channel of Stony brook with Charles river. It is an irregular water way with abrupt banks densely covered with trees and shrubbery enclosed between two roads named Charlesgate East and Charlesgate West, the street architecture making a formal frame for a bit of simulated wild nature crossed by Beacon street, commonwealth avenue, and the Boston and Albany Railroad, with low-level and plain bridges without architectural features.

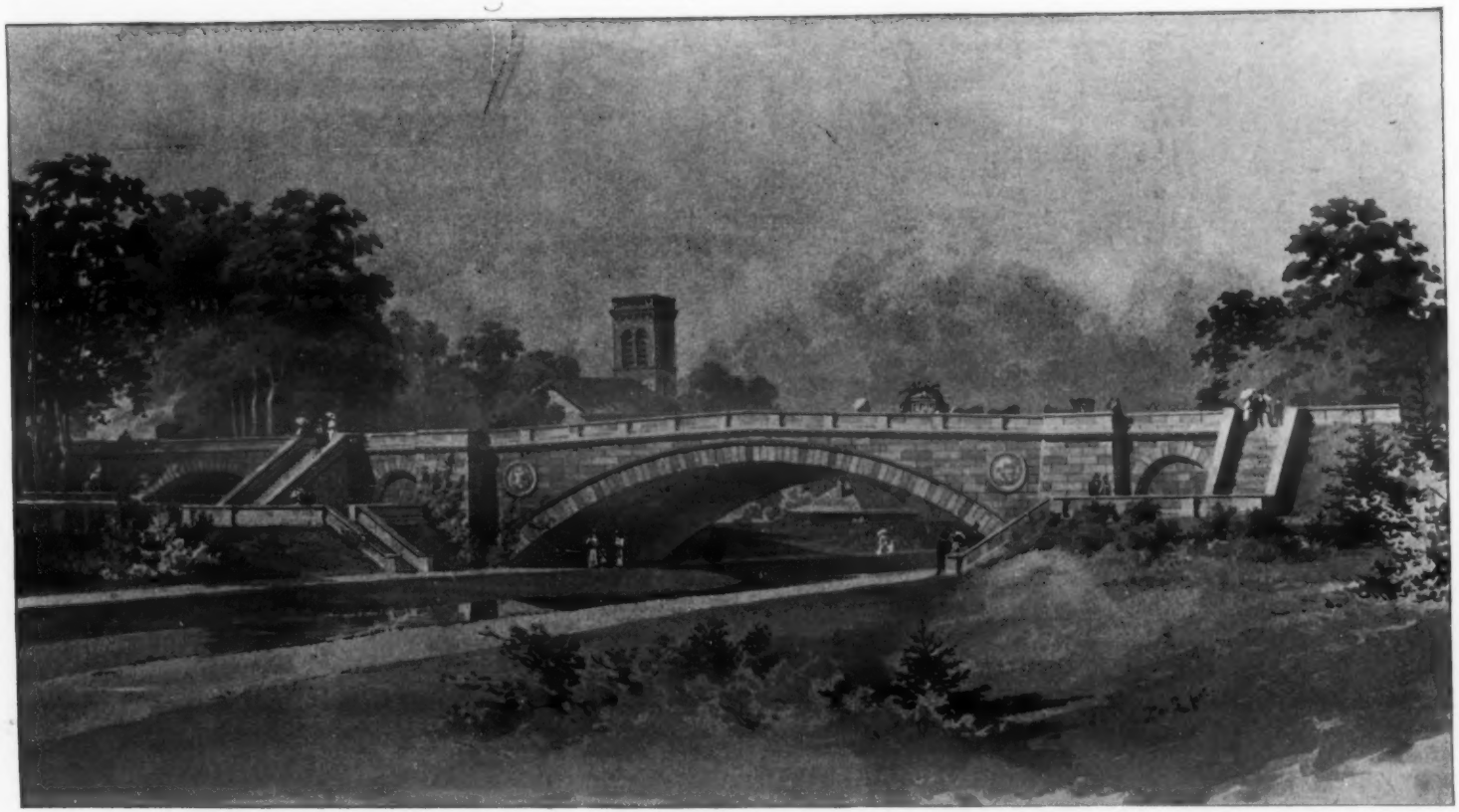
The Fens is the second section of the Parkway, also known as "Back Bay Fens," between Boylston road and Brookline avenue. It is an irregular tract of land and water enclosed by Fenway on the eastward and southward and Boylston and Audubon roads on the westward and northward boundaries. It is primarily an engineering work designed to effect a drainage and sanitary improvement of vast importance; a landscape treatment was found to be the most effective and economical form of dealing with the problem.

Stony brook is a stream subject to sudden and violent floods; the sewage deposits on the Back Bay flats here were a menace to

THE FENS — STONY BROOK BRIDGE.

the health of the city and threatened the ruin of the Back Bay district as a first-class residential section. In the necessity of meeting these difficulties the entire modern park system of Boston had its beginning. The noisome flats were taken for park purposes, and the engineering and landscape experts employed devised between them a plan for solving both these difficulties of flood and of sewage pollution. Two broad basins were provided of sufficient capacity to hold and retain the storm waters of Stony brook at times of flood coincident with a period of high tide in the harbor, the ordinary flow of the brook being discharged through a covered channel. The filling in of the flats remedied the danger to health. To give the desirable landscape aspect to the scene a strikingly original but beautifully simple design was adopted, in simulation of the characteristic salt-marsh scenery of the New England coast—a brackish creek, meandering amidst fens with bosky banks. This landscape was entirely created from a basis of foul tidal flats, but so natural is its aspect, so resemblant to scenes that once existed in the near neighborhood, that it gives the impression that, by some fortunate accident, a typical landscape of this character had been preserved for its exceptional charm in the midst of the city growing up around it, and finally utilized as the motive for a park improvement. The water level in the Fens is maintained at an average of three feet below mean high-water mark in the tidal basin of the Charles. A tidal rise and fall of a few inches keeps the water in circulation and prevents stagnation, modifying the inflowing fresh water sufficiently to give it a brackish character. At times of sudden flood in Stony brook the marshes are overflowed and the basins have temporarily the appearance of lakes until drained by the fall of the tide in the harbor.

In the landscape results the expectations formed from Mr. Olmstead's discussion of the proposed plan in the park report for 1879 have been fully realized. Said Mr. Olmstead: "It may be confidently anticipated that, under judicious detailed treatment, the several broader constituents which have been named—the waving fenny verdure, the meandering water, the blooming islets, and the border of trees and underwood following the varied slope of the rim of the basin, like the hanging woods of a river bank—



RIVERWAY — SKETCH FOR LONGWOOD BRIDGE.

would dispose themselves in compositions of a pleasing character. The effect would be novel, certainly, in labored urban grounds, and there may be a momentary question of its dignity and appropriateness, but this question will, I think, be satisfactorily answered when it is reflected that it represents no affectation or caprice of taste, but is a direct development of the conditions of the locality in adaptation to the needs of a dense community. So regarded it will be found to be, in the artistic sense of the word, natural, and possibly, to suggest a modest poetic sentiment, more grateful to town-weary minds than an elaborate and elegant garden-like work would have yielded. * * * The tints, lights and shadows and movement of salt-marsh vegetation, when seen in close connection with upland scenery, are nearly always pleasing and sometimes charming."

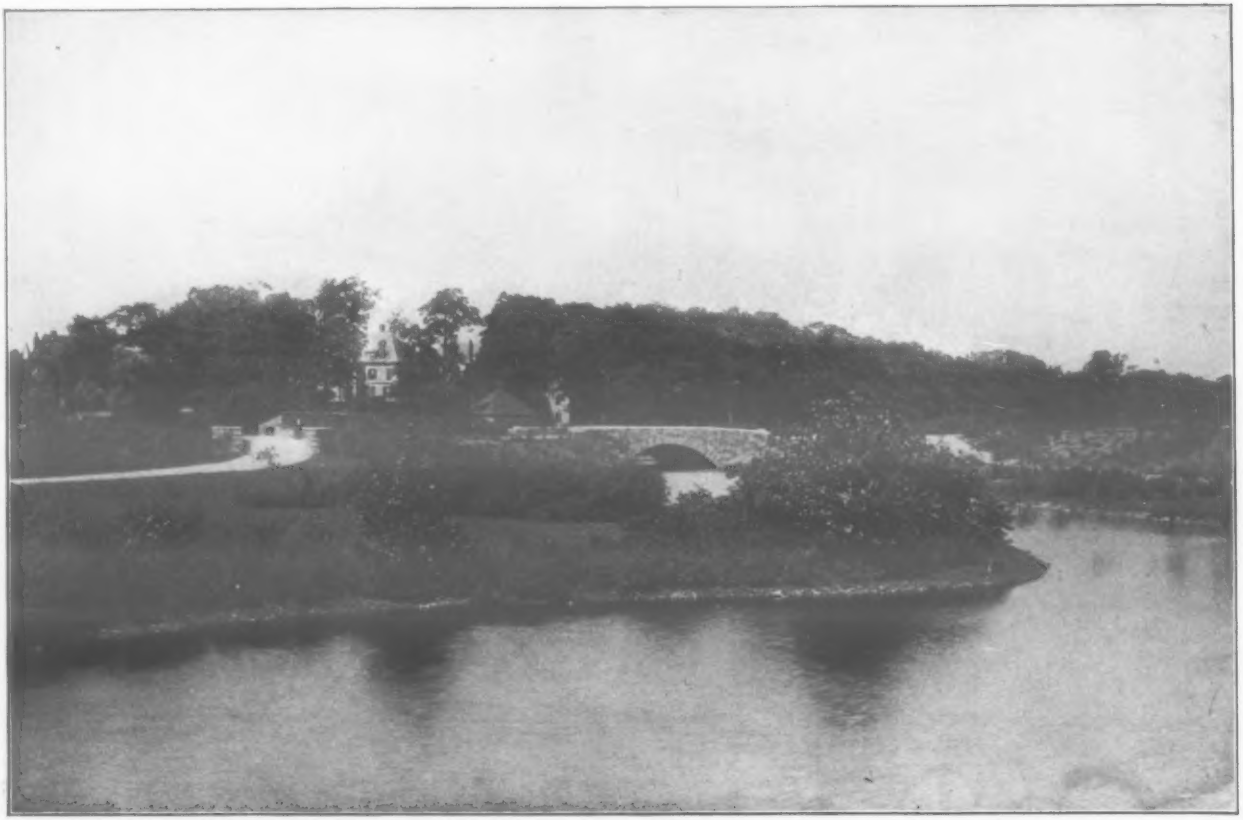
From Boylston road, near the bridge, a footpath begins the line of the main walk, or stroll, through the Parkway. It follows the fenside, embowered in trees and shrubbery, with diversified views over the water coming close to the shore, here and there, in pleasant little intervals of sandy beach. In the borders are flowering shrubs in great variety, together with a profusion of herbaceous perennials, affording an uninterrupted procession of bloom from the earliest spring to late autumn, and suggesting that the rich and varied growths of neighboring gardens had run wild, and naturally established themselves here.

"The Ride," or saddle-path, of soft gravel, also begins at Boylston road and follows the general course of Fenway and its continuing drives through the Parkway, taking a course of its own through the shrubberies wherever space permits, and carefully designed so as not to cross footways at grade wherever it can be avoided. A branch of the Ride connects with the saddle-path on Beacon street through Brookline to the Chestnut Hill Reservoir. It may here be noted that Boston is supplied with special provisions for equestrian exercise to an extent greater than any other city in the world. London, with all its riding, has less than a mile of saddle-path. In the Boston park system there are six miles, making, with the three miles of Beacon street, a total of nine miles.

Both for pleasure ways and convenience of traffic numerous bridges are necessary throughout the Parkway, and these have been

given an appropriate architectural character, lending materially to the picturesque interest of the scenery. In the Fens there are four of these bridges. Most important is Boylston bridge, a high structure carrying Boylston road with its impressive line of Lombardy poplars, spanning the water with a noble arch. From certain points of view looking southward, particularly from Commonwealth avenue bridge, this arch is the frame of a beautiful quiet, distant rural scene. This bridge was designed by the great architect, the late H. H. Richardson. Agassiz bridge is a rustic structure of five narrow arches varying in height, built of rough conglomerate from Franklin park and draped with herbaceous and trailing plants growing from the crevices. It carries Agassiz road across the Fens and separates the two basins. The Stony Brook bridge, designed by C. Howard Walker, carries Fenway across the canal-like channel by which Stony brook flows into the Fens at Huntington entrance. The formal character of the canal invites a more elegant treatment in the bridge architecture than is given the other bridges; it is built of brown brick in Italian style, with light arches. Since the footway passes beneath the bridge, and crosses by a light iron separate structure, the arches are lined with glazed brick to give an attractive appearance and are lit by electric lights at night. Fen bridge is a simple rustic structure of boulders mantled with vegetation after the fashion of Agassiz bridge. It connects Fenway and Audubon road. The Fens end here, although the brackish water continues to Brookline avenue.

The project of the Riverway section of the Parkway, like the Fens, had its origin in a sanitary problem. The neighboring residence sections in Boston and Brookline were threatened with deterioration by the pollution of Muddy river with sewage. To avert this the improvement was carried out by the harmonious co-operation of the Boston and Brookline park commissions. The greater part of the Riverway lies in the two municipalities, the watercourse forming the boundary. The Riverway embraces that section of the Parkway between Fen bridge and Tremont street. The more important portion, including the main drive, lies on the Boston side. It follows the line of the stream known as Muddy river, which gave to Brookline its original name of "Muddy River Hamlet" and supplied the circumstance which gave that town its present name in



RIVERWAY — BELLEVUE STREET BRIDGE AND FOOTBRIDGE.

the fact that the boundary between it and Boston was formed by a "brook-line." This watercourse takes the surface drainage from Jamaica pond and also from the valley traversed by the Newton circuit of the Boston & Albany Railroad, beyond Brookline Village.

A remarkable transformation has been effected in this valley. The character of its original rural charm has supplied the motive for the design, and its beauty has been greatly enhanced by the conversion of an insignificant tidal creek into a fresh-water river of tranquil flow, with banks of loveliest verdure and clear waters navigible for small craft. It resembles in character one of the smaller English rivers. Indeed, the whole character of the scenery is strongly English in its suggestions, with the calm reaches of meandering water, the various beautiful bridges that span the stream, and the square tower of the chapel at Longwood as the chief landmark of the valley—the central feature of many of the perfect pictures of which the region is full, and which already make the Parkway a favorite sketching ground for painters.

The bridges in the Riverway are varied, but simple and substantial in character, and give pleasing accents to the scenery. The Longwood footbridge, built for convenient communication with the Longwood railway station from the Boston side, is composed of two light and graceful arches at different levels, the higher level spanning the saddle path and the lower the stream. A round tower on the bank close by, for shelter and a point of view, unites architecturally with this bridge. Another bridge is a "double-deck" affair, the upper portion carrying the Audubon road branch of the Ride across the river on arches of masonry, while, beneath, transversely through these arches the footway crosses on a light ornamental structure of iron.

Other features of the Boston park system will be described in an article which will appear in this magazine next month.

REQUIREMENTS IN THE MANUFACTURE OF PAVING BRICK AND SEWER PIPE.

*By Heinrich Ries.**

ENGINEEERS have heretofore held, and do so still to some extent, that a paving brick whose crushing resistance is less than 10,000 pounds per square inch should be rejected, and some have even set the limit at 12,000 pounds. It was furthermore thought by many that this was the most important test to which the brick could be subjected; opinion is however changing, for it is beginning to be understood that in actual usage the brick is seldom, if ever, subjected to such pressure. For paving brick the absorption and abrasion tests are more important.

The paving-brick industry and market are confined largely to the cities of the Central States, Philadelphia being the only large Eastern city which has adopted brick pavements to any extent. One reason for this may be that the cost of transportation prevents competition with asphalt. Over one-half the cities now using brick for paving are in Ohio, Indiana, Illinois and Iowa, these states being the center of manufacture.†

This must be one which will produce a "vitrified" product. This term, which is misleading, simply means that the clay in burning is brought to incipient fusion, and thereby forms a tough homogeneous mass. The clay while attaining this condition should be able to keep its shape.

Vitrification begins at a red heat in most clays, and it is often found that a mixture of two clays—one possessing refractoriness and the other fusibility—gives the best results. A sufficient amount of iron is also necessary to give the brick a red color in accordance with popular demand. Silicate of iron is apt to form blotches on the surface. Mr. Mead ‡ claims that in order to vitrify a clay should contain at least 3 per cent. potash, 3½ per cent. soda,

* Condensed from an article on "Technology of the Clay Industry," to appear in the annual report of the United States Geological Survey.

† For map showing cities where factories are located and brick pavements laid, see D. W. Mead, PAVING AND MUNICIPAL ENGINEERING, January, 1894.

‡ D. W. Mead, loc. cit.

or 5 per cent. lime or magnesia, or 8 per cent. iron, or a combined proportion of any or all of these fluxes equal to these amounts.

The classes of materials used are Silurian, Devonian and Carboniferous shales, impure fire-clays, and less often surface deposits of Quarternary clay. The latter is apt to be too fusible.

The heat required to vitrify a clay varies, and some of the fire clays used can not be said to vitrify. In the Ohio clays* it was found that the heat required to vitrify the clay or shale was about 1860° F. The fusibility seemed to be due partly to the alkaline earths and alkalies present. The iron did not seem to aid much in the fusion, as vitrification began while the iron was still in form of sesquioxide, and that a subsequent elevation of the temperature breaks it up, as is shown by the darker color of the brick.

When clay of a shaly nature is used, it has to be first ground to powder in a dry pan. This consists essentially of a circular iron pan with a perforated bottom. In the pan are two iron wheels 6 to 14 inches wide and weighing 2,000 to 6,000 pounds, and which revolve by the tangential friction of the pan floor. Scrapers attached to the axle carrying the wheels throw the clay under the latter, and when fine enough it falls through the perforated bottom. The capacity of a dry pan varies with the size of the screen plates of the bottom and character of the clay. The maximum record is 200 tons of shale fire-clay in ten hours, through a one-eighth and three-sixteenth inch mesh bottom, but the average capacity of one pan with one-eighth inch mesh bottom is 100 tons for the same time.

The ground clay passes from the dry pan to the screen by means of a bucket elevator. All manufacturers do not screen their clay, trusting to the dry pan to reduce it to sufficient fineness. Three general types of screen are used :

1. Inclined screens, 10 to 14 feet long, with wire cloth or perforated metal bottom. This is the simplest and cheapest form, but has small capacity.

2. Rotary screens of cylindrical or octagonal form, often provided with automatic devices to make the clay pass through them more quickly.

3. Shaking screens, fixed at one end and driven by a crank and piston or eccentric. They have a perforated metal bottom, and are cheap and simple in operation.

* Geol. Surv. Ohio, VII, p. 138.

This is done in wet pans or pug-mills. These are like dry pans, but have a solid instead of perforated bottom. The clay is charged in lots of 600 to 1,200 pounds, and water added to it. The tougher and more refractory the clay the finer it must be ground, while if easily vitrified it need not be so fine. The action of the wet pan is very rapid, a charge for bricks being tempered in two or three minutes, and for sewer pipe in four to five minutes, and it is the most thorough tempering machine. When sufficiently tempered, the clay is removed through a trap-door in the bottom of the pan, or else by means of a specially constructed shovel. Wet pans have a greater capacity, and are more efficient than pug-mills, but they consume more power.

Pug-mills consist of a horizontal trough in which there revolves a shaft bearing knives. The material is charged at one end, together with water, and becomes thoroughly mixed as it passes forward, the speed being controllable by the angles which the knives make with the shaft. Pug-mills occupy less space than dry pans and require less power, but are less effective.

Nearly all paving brick manufacturers use stiff-mud machinery. In stiff-mud machines the clay is tempered quite stiff and is forced from the machine in the form of a bar, which is then cut up into brick. Two types of stiff-mud machines exist—the auger and the plunger. In the plunger machine the clay is charged into an upright iron cylinder, and issues from it through a die and under great pressure. This bar of clay is received on the cutting table, and when it has issued to a certain distance, a frame bearing a number of parallel wires is drawn over and cuts the bar into a number of pieces, each equal in size to a brick.

Auger machines consist of a horizontal tapering cylinder, in which there revolves a shaft bearing knives and, at the smaller end of the cylinder, a screw. The clay is charged at the wide end and becomes compressed as it moves forward toward the die, through which the screw forces it onto the cutting table. The auger machine is often provided with an automatic device for cutting up the bar of clay, which insures continuous action; it is also called end cut or side cut, according as the section of the bar of clay has the same area as the end or side of a brick. To increase the capacity of an auger machine several bars of clay may be forced from it at once.

Auger machines consume more power than plunger machines, but with their continuous action have a much greater capacity. The automatic cutting device has thus far only proved applicable to end-cut brick.

Stiff-mud machines are among the cheapest used, but one objection to them is the laminated character which they impart to the brick. This fault arises partly from the flow of the clay through a die and also from the effect of the screw of the auger machine. It has been found that rich, fat clays laminate most. If in burning the brick is vitrified the effect of the lamination is partly lessened. The average capacity of a stiff-mud machine is 30,000 per day, but some machines using the automatic cut-off have produced 75,000 in ten hours.

A combination machine is described by Prof. E. Orton, Jr.,* which consists of "a vertical pug-mill to force the clay downward, and a large mud wing or revolving arm to give the final propulsion to the clay. This mud wing forces the clay down into a set of molds arranged around the periphery of a horizontal table. Each mold-box is filled with clay, and, when full, comes under a pair of plungers acting vertically, one working under the clay and the other down on it. The clay is thus compressed into a solid block, which is subsequently removed when the movable bottom of the box is elevated to the surface of the table." The advantage of this machine is that the brick has no structure, and a very plastic clay can be worked. The daily capacity is about 20,000 brick.

The dry-press process has been tried for making paving brick, but thus far has met with little success. Its most important application is for the manufacture of pressed brick.

Most paving brick receive no further treatment to alter their shape, but some manufacturers repress the green brick, the advantage claimed being production of a better and smoother shape, as well as a denser product. The Ohio geological survey made a number of rattling tests of plain and repressed brick from several factories, and the results are somewhat in favor of the repressed material, but are not conclusive.†

* Ohio Geol. Surv., VII, 1893.

† Ohio Geol. Surv., VII.

Excluding open-air drying, which is rarely used for paving brick, the methods used are :

Drying floors.—These are brick floors with flues underneath to conduct the heat from the fire-place, situated at one end. They are generally large enough to hold a day's output. The advantage is cheapness, but the objections are great inequality of heat at the two ends of the floor and the amount of handling, as the bricks have to be spread and removed by hand. The chief application of drying floors is in the manufacture of fire brick.

Sewer-pipe floors.—The floors of the building where the drying is done are slatted instead of solid, and the heat is provided by steam-pipes arranged around the sides of the building. This method is cheap and very safe, but slow. It requires about the same amount of labor as the first method, but the original cost of plant is considerable.

Chambers driers.—These are essentially tunnels made of brick and arranged side by side. The green brick are piled on cars, which are run on tracks into the tunnels. They are heated by flues under the track, and coal, coke, wood, oil, or gaseous fuel are used. Their theoretical action is good, but they are not found to be so in practice. Two objections are, danger of cracking, due to sudden drying, and large amount of labor required.

Progressive driers.—These are very similar to the preceding, but the green ware is run in at one end, and the dried material is removed at the opposite end. Air and heat enter at the end where the bricks are removed, and the draft is produced by stacks or fans, preferably the latter. The air is heated by passage over steam pipes or through fire-places. This method is, perhaps, the best and safest means of drying brick. Drying has also been done in the kiln by drawing the hot air from a cooling kiln to one not yet burned.

This is usually done in round or rectangular down-draft kilns. Each type of kiln has several fire-places, and the products of combustion are conducted to the top of the kiln by "pockets" on the inside walls, and then pass down through the brick and out through flues under the floor of the kiln. The rectangular kilns have several stacks to insure an equal amount of draft to all portions of the

kiln, while the round forms generally have one stack. The latter have a capacity for about 30,000 brick.

In burning the temperature is gradually raised to the point of vitrification and held at this temperature for several days. It is then cooled very slowly to anneal the brick and give a hard, tough product. Quick cooling makes a brittle brick. The following measurements have been made by Professor Orton in Ohio,* and give an idea of the temperature reached in paving-brick kilns. Unfortunately the measurements were made with a lunette pyrometer, which is apt to give an error of 50°:

TEMPERATURES REACHED IN PAVING BRICK KILNS AS DETERMINED BY THE OHIO GEOLOGICAL SURVEY.

Material.	Portion of kiln.	Temperature, Fahrenheit.
		Degrees.
Fire-clay	Kiln at best heat	1,862
Shales	do	1,800
Fire-clay mixture	Kiln past best heat	1,702
Fire clay	Kiln at highest heat	1,920
Shales	do	1,800
Do	do	1,840
Fire-clay	Kiln at best heat	1,920
Do	Kiln at about best heat	1,830

Three tests are usually applied: Absorption, abrasion and crushing.

Absorption.—A thoroughly vitrified brick must of necessity be dense, and absorption will therefore be a measure of the porosity. The absorption is determined by weighing the thoroughly dry samples, immersing in clean water from 48 to 72 hours, then wiping dry and weighing again. Vitrified bricks should not show a gain in weight of over 2 per cent. There are cases where bricks of apparently good quality show a greater absorption than this, but they have great toughness and refractory qualities. Bricks made from fire-clays which will not vitrify so easily will naturally show higher absorption. This absorption test is of great importance in our severe northern climate.

Abrasion.—This test approximates closely the conditions under which the brick is used, and is therefore an important one. The usual method of conducting this test is to put the bricks in an or-

*Ohio Geological Survey, VII, p. 138.

dinary foundry rattler, filling it about one-third full. It is then set in rotation at the rate of about 30 revolutions per minute, and about 1,000 turns are sufficient. The bricks are weighed before and after to determine loss by abrasion. A more recent modification is to line the rattler with the bricks to be tested and then put in loose scrap iron. This is claimed to give more accurate results and avoids loss by chipping due to the bricks knocking against each other, as in the previous method, although even this was obviated somewhat by Professor Orton, Jr., by the introduction of a few billets of wood into the rattler. The abrasion test may also be made by putting the weighed bricks on a grinding table covered with sand and water, and noting the weight before and after grinding.

Crushing.—The amount of pressure which a paving brick shall be able to withstand is an unsettled matter. There are bricks in use which crush at 5,000 pounds per square inch, while others will stand 15,000 pounds. Some engineers refuse to accept a brick which will not stand 12,000 pounds per square inch, but this limit is undoubtedly too high, for when laid in pavements it is abrasion and not so much pressure which the bricks are subjected to. Furthermore, experiments show that a brick of high crushing power may have great absorption and little vitrification.

From a large series of tests recently made by Mr. Ficks, the following facts were developed:

1. A brick which stands rattling well has ample crushing strength, and rarely chips under less than 5,000 pounds per square inch, or crushes under less than 10,000 pounds. The crushing strength tends to vary with the resistance to abrasion, however, but more slowly and irregularly.

2. The transverse strength also tends to vary with the resistance to abrasion, but more slowly and irregularly.

3. The toughest brick usually absorb the least water, but exceptions occur.

Some valuable and interesting tests were recently made by the Ohio geological survey, to determine the relative merits of fire-clays and shales for the manufacture of paving brick, as well as the influence, if any, of the method of manufacture used. Twenty-three varieties of shale brick, or bricks whose largest constituent is shale, were grouped together; fifteen varieties of fire-clay brick;

four varieties composed of shale and fire clay-mixed in equal proportion; the varieties made of Ohio river sedementary clays. The average of these four classes of results were as follows:

RESULTS OF TESTS OF FIRE-CLAYS AND SHALES FOR THE MANUFACTURE OF PAVING BRICK, BY THE OHIO GEOLOGICAL SURVEY.

Kind.	Absorption.	Rattling.	Crushing.	
			Square inches.	*Cubic inches.*
Shales	1.17	17.61	7,307	1,764
Fire-clay	1.62	17.32	6,876	1,678
Mixture	1.44	18.72	5,788	1,400
River clay	1.36	19.02	4,605	1,176

The required qualities of a clay for this purpose are essentially those demanded of a paving brick clay, and the preparation and tempering are done in the same manner, but more thoroughly. Molding is done in a sewer-pipe press, which consists of two vertical cylinders, one above the other. The upper one is the steam cylinder and has a diameter of about 40 inches; the lower or clay cylinder is usually less than half the diameter of the other. The piston of the steam cylinder is moved both upward and downward by steam. Clay is charged at the upper end of the clay cylinder, and issues from the lower end through a specially constructed die. Inside the cylinder, at its lower end, is the "bell," which regulates the internal dimensions of the pipe. The clay pipe issues from the press until of sufficient length, when the machine is stopped, and the pipe cut off and removed to the drying floor. The machine starts again and another length of pipe is allowed to issue. The pipe are set on slatted floors to dry slowly; there are often several of these floors, and the heat is provided by steam pipes arranged along the walls of the building. Burning is done in round or rectangular down-draft kilns and takes four to six days. Less time is required than with paving brick on account of the lesser thickness of material to vitrify.

All sewer pipe are glazed with salt, which is put into the fire holes and volatilizes, the vapors spreading through the kiln and uniting with the silica on the surface of the pipe to form a glazed coat. The following reaction occurs:

$$NaCl + H_2O = HCl + NaOH$$
$$NaOH + nSiO_2 = NaO_2nSiO_2 + H_2O$$

Glazing requires one to two hours. Some manufacturers add manganese to the salt in order to produce a glaze of the proper color.

The chief sewer-pipe manufacturing region is in the Ohio Valley, which produces not only the greatest quantity of pipe, but has also three of the largest factories in the world. Other producing districts are in New Jersey, Colorado, California, Maryland, and New York.

PRODUCTION AND IMPORTATION OF ASPHALT.

*By E. W. Parker.**

THE total amount of asphaltum and bituminous rock produced in the United States in 1894 was 60,570 short tons, valued at $353,404. Compared with 1893 this shows an increase in product of 12,791 short tons, but a decrease in value of $18,832. The increased production was due to greater activity at the bituminous sandstone mines, both in California and Kentucky, while a decrease in the production of the purer forms of asphaltum in California and Utah is accountable for the comparative falling off in value. There was no bituminous limestone mined in Utah during 1894. The product, therefore, was limited to bituminous sandstone and hard, or gum, and liquid asphaltum. The production of these materials in 1894 is shown in the following table:

PRODUCTION OF ASPHALTUM AND BITUMINOUS ROCK IN 1894.

Products.	Short tons.	Value.
Asphaltum	9,790	$195,800
Bituminous rock	50,780	157,600
Total	60,570	$353,400

Divided by states, the product was as follows:

PRODUCTION OF ASPHALTUM, ETC., IN 1894, BY STATES.

States.	Short tons.	Value.
California	51,187	$251,991
Kentucky	5,383	21,409
Utah	1,000	35,000
Texas	3,000	45,000
Total	60,570	$353,400

*Condensed from special advance sheets of the annual report on Mineral Resources by the United States Geological Survey.

The following table shows the annual production of asphaltum and bituminous rock in the United States since 1882:

PRODUCTION OF ASPHALTUM AND BITUMINOUS ROCK SINCE 1882.

Years.	Short tons.	Value.	Years.	Short tons.	Value.
1882	3,000	$10.500	1889	51,735	$171,537
1883	3,000	10 500	1890	40,841	190,416
1884	3,000	10,500	1891	45,054	242,264
1885	3,000	10,500	1892	87,680	445,375
1886	3,500	14.000	1893	47,779	372,232
1887	4,000	16.000	1894	60,570	353,400
1888	50,450	187,500			

The total amount of hard and liquid asphaltum produced in California during 1894 was 5,790 short tons, and of bituminous rock, 45,397 short tons, the aggregate value of which was $251,991.

The entire product of Kentucky is bituminous sandstone, all of which is used for street paving in the interior cities. The product in 1894 was 5,383 short tons, valued at $21,409, against 1,129 short tons, valued at $6,570, in 1893.

A considerable deposit of asphalt has been noticed in Park county, Montana. The material is unusually pure.

The imports of asphaltum into the United States include hard asphaltum from Cuba, Trinidad asphaltum from the Island of Trinidad, off the coast of Venezuela, South America, and bituminous limestone from Neufchatel and Val de Travers, in Switzerland, and Seyssel, in France.

The following table shows the imports of crude asphaltum since 1867:

ASPHALTUM IMPORTED INTO THE UNITED STATES FROM 1867 TO 1894.

Years ended—	Quantity.	Value.	Years ended—	Quantity.	Value.
	Long tons.			*Long tons.*	
June 30, 1867	.....	$6,268	June 30, 1881	12,833	$95.410
1868	185	5.632	1882	15,015	102,698
1869	203	10,559	1883	33,116	149,999
1870	488	13,072	1884	36.078	145,571
1871	1,301	14,760	1885	18,407	88,087
1872	1,474	35,538	Dec. 31, 1886	32,565	108,528
1873	2,314	38,298	1887	30,808	95,735
1874	1,183	17,710	1888	36,494	84,045
1875	1,171	26,006	1889	61,952	138,163
1876	807	23,818	1890	73,861	223,368
1877	4,532	36,550	1891	102,433	299,350
1878	5,476	35,932	1892	120,255	336,868
1879	8,084	39,635	1893	74.774	196,314
1880	11,830	87,889	1894	102,505	313,680

GRANITE FOR STREET PAVEMENTS.

*By William C. Day.**

THE granite paving block industry has increased largely since 1880, the number of granite blocks made in 1889 in the various states aggregating nearly 62,000,000.

Streets paved with the large-sized block used at first were found to be more difficult to keep in repair, worse for horses, and rougher on vehicles than pavements made of the smaller blocks now in general use. There is no uniform standard of size, as specifications of the various cities call for different sizes, but the variations are not great, and blocks 3½ to 4½ inches wide, 6 to 7 inches deep, and 8 to 12 inches long are generally preferred. In New York City, Brooklyn, and Philadelphia blocks are a trifle longer as more commonly used, while in many of the western and southern cities the length does not exceed 10 inches. New Orleans, owing to the peculiar nature of its streets, takes blocks much larger.

The manufacture of paving blocks, though an important adjunct of the granite business, varies nevertheless for obvious reasons in many of its details from the ordinary methods of granite cutting. The high skill and fine workmanship of the stone mason are not needed, but a quickness in seeing and taking advantage of the directions of cleavage, as well as a deftness in handling the necessary tools, is requisite.

Specifications call for blocks so quarried or dressed as to present substantially rectangular faces with practically straight edges. The corresponding dimensions of opposite faces must not vary more than one-half inch, and the surface must be free from bunches, depressions, and inequalities exceeding one-half inch.

In a number of the New England states there was an increased tendency toward the manufacture of paving blocks rather than the production of stone for building or other purposes. The following table shows the value of the granite paving block industry in the various productive states:

* Condensed from "The Stone Industry in 1894," in sixteenth annual report of the Mineral Resources of the United States.

VALUE OF GRANITE PAVING BLOCKS MADE IN 1894, BY STATES.

States.	Value.	States.	Value.
California	$31,000	North Carolina	$107
Connecticut	32,100	Pennsylvania	258,777
Delaware	80,000	Rhode Island	115,000
Georgia	225,910	South Carolina	9,085
Maine	710,836	Vermont	32,711
Maryland	18,885	Virginia	42,000
Massachusetts	593,726	Wisconsin	20,450
New Hampshire	24,000		
New Jersey	60,000	Total	$2,254,587

SEWERS AND SEWER GAS.

By J. W. Crary, Sr., Brickmaker and Builder.

THE excellent article in the August number of PAVING AND MUNICIPAL ENGINEERING, by Wm. Paul Gerhard, C. E., suggests to me the pertinency of a few remarks on sewer building and sewer gas. I do not propose to go into an elaborate, technical treatment of these subjects.

There is nothing that so much concerns the health of a city as perfect drainage and disposition of sewer gas. As yet, there is not a city in the world that can show a perfect system of drainage, so that sewers (with few exceptions) have been built too small, often badly built and with insufficient grade or "fall" to carry off the water. I need not cite instances of these facts. They have been too common to escape the notice of intelligent people. Some of the main troubles are that the city officials undertake to figure out just exactly the needed capacity of a sewer. If we grant that science can forecast the storms, God only can know just how great the wind or water will be; so that it is mere futile assumption to say just how much water will fall on a given space of ground, and therefore calculate the needed capacity of a sewer. The only way to even approximate the needed size of a sewer, to be right, is to multiply the unit of ascertained size, based on ordinary rainfall, by at least three, then see that the materials and workmanship are perfect, and this will reach the best economy and efficiency.

As to sewer gas and mephitic air in sewers, man-holes in

sewers, and gas traps for water closets, are some of the most fruitful breeders of disease in cities. Various attempts have been made to dispose of this trouble. Disinfectants and filtering have been scientifically applied, all to no practically good result. The only feasible and sure economical way to dispose of sewer gas is by cremation. If a furnace with a sufficiently large smokestack be kept in constant operation, at the highest point or grade of sewers, and suitable pipes be laid from the sewers, to connect with the smokestack, all the gas in the sewers, within a long distance of the smokestack, will be drawn to it by its vacuum and consumed.

I have tried this plan of disposing of gases in houses and found it efficient and perfect. As to the chemical disinfectants usually employed to cleanse water for family use, they can never be applied to large reservoirs; they would be too uncertain and expensive. Aluminous earth or pure clay is nature's cleanser. If pure clay, in solution or in a dry, pulverized condition, be stirred in foul water in a short time all animal and vegetable filth will be precipitated to the bottom, and the water will be comparatively pure. The waters of the Mississippi river magnificently illustrate this fact. I may say more on this subject in this magazine hereafter.

CURRENT INFORMATION.

DEMANDS OF CHICAGO CONTRACTORS.

Objection is offered by some of the prominent street contractors in Chicago to the city's method of letting contracts. They say they want, first, plans and specifications which call for honest and good work; second, they demand that the work shall be inspected by inspectors who will inspect and not be wistfully hunting for "boodle;" third, they believe there should be a board of three commissioners to look after street work and repairs, and have full jurisdiction in discriminating as to the kinds of pavement best suited to different localities; fourth, they desire that there shall be a standard for material and pavements, and that no bids should be received for work where the contractor can not possibly do it at the price bid.

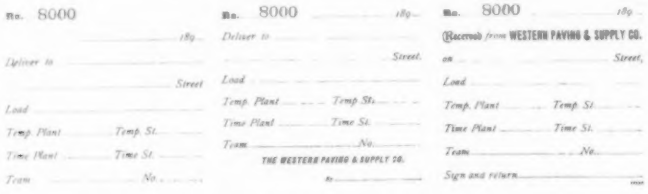
Materials for and the construction of street pavements have been given unusual prominence lately by the city council. Contractors have also had a prominent part in the discussion, and all of the large contractors favor a concrete base for all kinds of street paving with the section of macadam and plank roadways. Mr. Perkins, of the Western Paving and Supply Company, and who has most decided views on the subject of a concrete base for the streets of Chicago, says:

"The soil is spongy in some places and hard in others. The only way to preserve an even surface is to first make a concrete foundation of broken stone, cement and sand. Each one of the materials mentioned abounds in great quantities in these parts. There are hundreds of thousands of tons of rock piled up along the side of the drainage canal that can be had with but little labor and almost without cost. Sand is equally plentiful, and in Milwaukee and Louisville the cement works are turning out any quantity of that material. After a good foundation is laid, it will last generations. Any kind of a top you like can be put on it. Chicago has everything at hand to construct the finest streets of any city in America, and at a minimum cost, if her citizens would only take the matter up in earnest. As long as 'boodlers' are able to control street contracts, reputable contractors will keep their hands off. Honest work we are willing to do for a just and equitable price, and not otherwise."

W. H. Lober, superintendent of the Barber Company, says: "We have laid twenty-seven miles of asphalt pavement in Chicago, and every yard of it is upon a concrete foundation. Outside of macadam roads, and where marshy places have board foundation topped with cedar blocks, a concrete foundation is absolutely necessary. If there was a large amount of street paving going on the price would go lower than it is now, at $2.35 and $2.40 per square yard. It is far cheaper in the end to put down concrete foundations than those of broken stone, which sink in soft places and make a road uneven, and soon wear out. We had no

city contracts under the last administration. There is a crying need of a change in the letting of street work. I would like to see a commission to look after this work and give contractors who are willing to do good work and guarantee it for a term of years a chance."

J. G. McBean does not believe in a concrete foundation for wooden blocks for the reason "that water which soaks in when it rains can not get out and rots the wood. Concrete is only good for a brick or asphalt pavement."



FAC-SIMILE OF FORM SHOWING CONDITION OF ASPHALT.

Assistant Commissioner of Public Works Moody, when questioned on the subject, said he believed a concrete foundation for streets was favored by the department when practicable, as it lasted longer, but what would do in one part of the city was not advisable for another. The cost of concrete over broken stone was only about 30 cents a yard, and it was certainly an improvement. "The asphalt work for the city now contemplated takes in several blocks on Wabash avenue, south of Fifty-third street, under contract with the Mexican Company, and the paving of Madison street, from Jefferson to Halstead street, the contract for which has not been let. This will finish up most of the street work for the year, as it could not be carried on very well during the severe cold weather."

HOW RECORDS ARE KEPT ON ASPHALT WHEN BEING LAID.

The care with which asphalt is handled in the paving of streets is indicated by the accompanying fac-simile copy of the form in use by the Western Paving and Supply Company. This is a triplicate form, bound in a large book, each of the three parts being about 2x2½ inches in size. The first part remains in the bound book as a stub. The second part is the order on the plant to be presented by the teamster, on which is entered the record of the load of asphalt taken out by him, both at the plant and where the pavement is being laid. The third part is the receipt, also showing the condition of the material. The two detached parts must be returned to the main office properly filled out and signed each day, and there is thus preserved a record of exact information regarding the condition of the asphaltic material during its use.

THE RIGHT OF A COMMON COUNCIL TO DETERMINE THE CHARACTER OF PAVING.

A decision has been rendered by the Illinois Supreme Court in the case of Cunningham against the city of Peoria, Ill. The suit refers to the paving of North Jefferson avenue, for which the city had adopted an ordinance providing for brick paving. The plaintiffs, Frank Cunningham and Rollo Wheeler, objected to the pavement, contending that they owned a good deal of vacant property contiguous to the improvement, and that, believing asphalt to be the better of the two paving materials, they wanted the aldermen compelled to

make a change. As the courts have repeatedly ruled that the city council is the proper judge of the character of the material to be used, this plea was useless. Other technicalities were urged and the case went into the county court, where a decision was made against the property-owners, and this decision is sustained by the supreme court.

THE GRAVEL USED ON CHICAGO BOULEVARDS.

Until they visited Chicago in a body recently, the aldermen of Joliet, Ill., were not aware of the value of the gravel deposits near there. They found in Chicago that the Joliet mound gravel has been used with apparently great success in the construction of boulevards. The material costs Chicago and other cities from $2 to $2.20 per cubic yard, while in Joliet it would cost but $1.10. The screenings, or loose dirt which clings to the gravel when wet, forms a sticky substance similar to blue clay, which, once hardened, equals cement.

ABUSES IN MAKING STREET OPENINGS.

Decided opposition is shown to the practice of tunneling under pavements for various purposes by S. Whinery, vice-president of the Warren-Sharf Asphalt Paving Company, and a recognized authority on public improvements. In a reply to a number of inquiries recently addressed to him by F. J. Hoag, of Toledo, O., Mr. Whinery writes:

"It is due to the property-owners, who bear the expense of sewer, water and gas connections, that they should be allowed to have such work done in the cheapest manner that will afford good sanitary work, and shall not be detrimental to the public good, or to the rights of citizens in the matter. On the other hand individuals should not be allowed to have such work done in a manner that will be detrimental to the municipality or to the interests of citizens or others who may have equitable, if not legal, right in the matter. Looking at the subject in the light of these general principles I would reply to the questions you ask as follows:

"The practice of tunneling under the paved streets where the tunnel or bore is more than six inches in diameter, ought never to be allowed; and where borings are made for pipes the bore ought to be made as small as will allow the pipe to be got into place. Judging from our pretty extensive experience, I think it may be safely asserted that it is practically impossible to refill a tunnel by horizontal filling and ramming, so that settlement will not result, and where settlement takes place the pavement over the trench, even where a good concrete foundation is used, is sure, sooner or later, to subside and require repairs. Such subsidence may not take place until months and often years after the tap has been made, and it is often then impossible to ascertain by whom the injury was done, or to collect costs of making necessary repairs. Our company has made hundreds of dollars' worth of repairs for which we have not been able to collect pay, because it was impossible to ascertain or prove who was responsible for the damage, or impossible to collect from parties if found. As the injury of the pavement was in no wise attributable to the pavement itself, it is manifestly unjust that the contractor who has guaranteed the pavement, or the city, if the pavement is not under guaranty, should be forced to bear the expense of the

repairs thus rendered necessary.

"The opening of tunnels, through which a man can pass to lay or adjust pipe is an offense which should be punishable by fine or imprisonment, or both, in every city.

"In regard to the use of iron pipes for sewer connections, so as to make the connection through a boring not over six inches in diameter, I think it practicable and allowable, if proper care is used. Wrought iron pipes are not as durable, when exposed to sewerage, as good vitrified stone-ware pipes, but good cast-iron pipe ought to give satisfactory results.

"Where borings are made and pipes thus inserted, care should be taken to refill the vacant space outside the pipe as well as possible, and the bore hole should be tightly filled at each end with cement mortar to prevent water flowing through and finding an outlet into or along the main sewer and eroding the surrounding earth, and gradually creating a large cavity where a small boring only existed at first. I know this sometimes occurs, for I have seen it in more than one instance.

"In regard to properly filling back trenches and openings in streets and pavements, it is certainly never safe to depend on plumbers doing this work without supervision by the city authorities, and, unfortunately, it is not usually safe to depend on ordinary city inspectors to supervise the work. They are very often as ignorant and as careless of the proper way to do the work as the plumbers themselves. The rule should be that all the material taken out of a trench should be gotten back into it when filled back. This is the only practicable and reliable standard by which to judge whether or not the back filling is properly done. We know from long experience that it is perfectly practicable to carry out this rule, and if inspectors were so instructed, and were faithful in seeing the instructions carried out, all trouble would be avoided."

ANNUAL MEETING OF NATIONAL BRICK MANUFACTURERS' ASSOCIATION.

The tenth annual convention of of the National Brick Manufacturers' Association will be held in Atlanta, Ga., beginning December 3, and continuing through the week. One session will be held in the forenoon of each day, thus giving the members the remainder of each day to visit the Exposition. Very low railroad rates will be secured over all lines, and particularly over those lines south of the Ohio river. The convention will be held in the Y. M. C. A. hall, which is but a block and a half from the Kimball House, which will be headquarters for the association during the week of the convention.

ELIMINATION OF SEDIMENT FROM WATER SUPPLY.

In his report regarding the operations on the Washington aqueduct and auxiliaries during September, Major Knight says that it has been supposed that much sedimentary material would be deposited from the Potomac water in its transit through the conduit and two reservoirs to the mains. No opportunity for verifying this supposition occurred until September 7, after the receiving reservoir was put in service July 27, 1895.

According to the scale for recording the condition of the water, the numbers 0 to 7, inclusive, correspond to very turbid water; 8–14, turbid; 15–21, slightly turbid, and 22–36, clear. The following is the

recorded condition of the water at Great Falls and at its entrance to the mains for the dates specified:

September	6	7	8	9	10	11	12	13
Great Falls	36	16	2	2	2	2	6	16
Distributing Reservoir	36	36	36	36	36	36	22	18

September	14	15	16	17	18	19	.0	21
Great Falls	32	36	36	36	36	36	36	36
Distributing Reservoir	18	17	17	18	22	25	31	36

This shows that five days of very turbid water at Great Falls caused five days of but slightly turbid water at the mains.

Major Knight reports good progress in the project for increasing the water supply for Washington by raising the height of the dam at Great Falls 2½ feet. The report of the work of testing the tunnel conduit will not be made public until after its transmission to congress.

PURIFICATION OF SEWAGE BY ARTIFICIALLY AERATED BACTERIAL FILTERS.

Report of the experiments conducted at Brigg's Wharf, Newport, R. I., to determine the value of a process for purifying sewage by means of artificially aerated bacterial filters, has been published by Colonel George E. Waring, Jr., under whose direction these experiments were conducted, during a period of five months, with a temporary plant erected over the main sewer outlet. The report says: "The experiments illustrate no new theory; they deal with no purifying process but the natural one of bacterial oxidation, which has been in constant operation since the first appearance of life upon the earth. Their aim has been to find a way of artificially producing conditions more favorable to natural bacterial action than can be found under ordinary circumstances. The process consists in the mechanical straining out of all solid matters carried in suspension in sewage, and their subsequent destruction by forced aeration, and the purification of the clarified sewage by bacterial oxidation of its dissolved organic matters in an artificially aerated filter.

"The results accomplished in the experiments exceeded the most sanguine expectations. Sewage loaded with grease, dirt, excreta and the putrid overflow of cesspools escaped from the tanks clear, white and limpid. The impurities were not passed through in disguise, the foul smell was not masked by other odors; the effluent water was actually clean — a good drinking water.

"This complete regeneration continued five months, and when the filters by which it had been performed were taken apart they, too, were clean. The filth had not accumulated in them; it had completely disappeared. The process is not only valuable as an economical and efficient means of purifying sewage; it is equally applicable to the cleansing of liquid wastes from slaughter houses, glue factories, fertilizer factories, garbage disposal works, silk and woolen mills—in short, it will purify all water that has been soiled by organic matter.

* * * * * *

"The process by which the impurities of the sewage are removed is the purely natural one on which depends the ultimate destruction of all organic matter. When sewage is spread over the surface of the ground, as in irrigation, it is exposed to the atmosphere in thin, broad sheets, and the bacteria which reduce its putrescible matters are active because air is abundant. The process in the aerating tank described above is essentially the same, but in this case the earth is massed in cubical form, and the at-

mosphere is made to pervade the mass, so that every conceivable plane within it presents—so far as bacterial activity is concerned—the conditions of a natural surface. The same is true with regard to the straining tanks. While the sewage is passing through them, the action is merely mechanical sedimentation. When the liquid has been drained off and the aeration has begun, the process and the result are the same as they would be if the accumulated sludge were spread in extremely thin sheets over the surface of a large area of soil."

After describing in detail the apparatus and the process of aeration, the report summarizes the result as follows:

"The suspended matters of sewage (sludge) can be mechanically withheld by straining slowly through suitable material.

"The filth accumulated by this straining material can be destroyed and the straining medium restored to a clean condition by mere aeration.

"The successive alternate operations of fouling and cleansing can be carried on indefinitely, without renewal of the straining material.

"The purification obtained by this straining process practically equals that accomplished by chemical precipitation, and is sufficient to admit of discharge into any considerable body of water not used as a source of domestic supply or for manufacturing purposes requiring great purity.

"Practically, all of the dissolved organic matter in sewage can be removed and purification to a drinking-water standard can be obtained by the use of suitably constructed bacterial filters.

"Such filters can be maintained in constant and efficient operation by suitable aeration.

"The erection of a plant capable of purifying large volumes of sewage upon a relatively small area calls for no costly construction. Repairs and renewals are merely nominal. The attendance required is but slight. There is no outlay for chemicals, etc. The only expense of mechanical operation is the driving of the blower or air-compressor.

"The process admits of wide variation in the selection of filtering material, and nearly every community can find, in its local resources, something suitable for the purpose."

A detailed report of the chemical work, by the engineer in charge, Mr. George W. Rolfe, A. M., accompanies the general report and presents the following conclusions from the experiments:

"A straining tank, constructed on the plan herein described, can be depended upon to move at least forty per cent. of the nitrogenous matter in ordinary sewage, if this sewage, rough-strained and free from mud, is applied continuously at the minimum rate of three million gallons per acre in twenty-four hours.

"The gross amount of sewage which such a strainer will take before clogging depends principally on variable constituents of the sewage, but also, to some extent, on the size of the voids of the filtering medium. For ordinary materials, with voids of not less than thirty per cent., and with particles larger than .20 inch, the minimum can be placed at 20,000,000 gallons per acre, when the sewage is applied contiuously.

"If the thick sludge is removed and the upper six inches of the filtering bed opened up by raking or

plowing after the filter is drained, an aeration period, not exceeding five days, is sufficient to restore the strainer to its original efficiency.

"Further experiments are necessary to determine the smallest efficient air supply for the cleaning of the strainers. It is much less than that used in the investigation.

"The efficiency of a strainer is little affected by the increasing amount of matter retained, up to the time of clogging; nor, within wide limits, is it influenced by the size or shape of the particles of the filtering medium.

"The strainer will preserve its efficiency indefinitely.

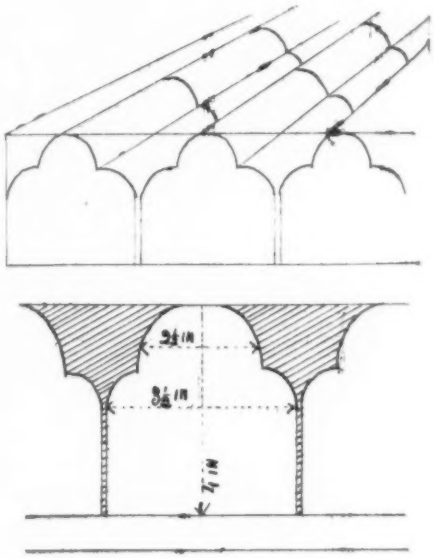
"An aerator, constructor on the plan herein described, after nitrification is established and the methods of distribution properly adjusted, will remove over ninety-five per cent. of the organic nitrogen of a strainer effluent, applied at the rate of at least 800,000 gallons per acre per day. It will continue to do this for an indefinite period, providing suitable arrangements are made for removing sludge at frequent intervals.

"A reduction of at least seventy-five per cent. can be made in the air supply to the aerators, as used in this investigation, without impairing their efficiency.

"Of coke and gravel, of practically the same size, used in aerators of similar design, the coke purified over twenty per cent. more sewage than the gravel."

A COMBINATION OF ASPHALT AND BRICK PAVING.

A new paving method, combining vitrified brick and asphalt, is the invention of J. J. Jeter, of Kansas City, who claims for it a measure of cheapness. Mr. Jeter proposes to make vitrified brick, eight inches long, four inches thick, and three and one-half inches wide at the base; midway the brick will be beveled two and one-half inches, leaving a narrow oval or top surface. Each end is beveled in the same way, making each brick the shape of a black-board eraser. Mr. Jeter's idea is to lay the bricks on a



concrete foundation and fill the interstices with asphalt, which would result in a running series of molds from curb to curb two inches deep and one inch wide. The pavement would present an appearance of a thread of brick running through an asphalt surface, each center of brick being three and one-half inches from the next. Mr. Jeter claims that the pavement will not run; therefore, brick can be laid on steep grades; that the thread of brick provides a foot-hold for horses, and that two-thirds of the asphalt material is saved; that the pavement is profitable at $2 per square yard. Asphalt costs in Kansas City now, $2.60 per square yard, and brick $1.45. Objections that have been raised to the paving are the rolling of the asphalt into the in-

terstices and the variance in the resistance of the vitrified brick and the asphalt, but Mr. Jeter is confident that either objection can be overcome. No tests have been made as yet, of the pavement, nor has it been passed upon by paving experts.

STANDARD SPECIFICATIONS AND TESTS FOR PAVING BRICK AND SEWER PIPE.

The Illinois Society of Engineers and Surveyors, at its last annual meeting, appointed a committee to investigate the existing specification requirements for paving brick and sewer pipe, together with methods testing same, and to recommend to the society at its annual meeting to be held in Galesburg, Ill., January 28 to 30, 1896, standard specifications and tests for each. Mr. A. D. Thompson, city engineer of Peoria, is chairman of this committee. The members of the sub-committee on paving brick are: Prof. Ira O. Baker, C. E., of Champaign, and D. V. Purington, of Chicago. The sub-committee on sewer pipe is composed of J. W. Alvord, C. E., of Chicago, and J. R. Hanna, of Monmouth. The steps taken in the work are explained in the following letters:

To the Editor of Paving and Municipal Engineering:

I herewith send you circulars, which I am forwarding to manufacturers of sewer pipe, manufacturers of paving brick, and to city engineers of all cities of more than 20,000 inhabitants. These circulars, as you can see, are the work of the committee on standard specifications and tests for paving brick and sewer pipe, appointed at the last meeting of the Illinois Society of Engineers and Surveyors, and we hope in this manner to procure the opinions of all persons interested in these matters regarding the various points upon which we expect to report, which opinions will aid us materially in making recommendations to the society that will be satisfactory to all parties concerned. *A. D. Thompson,*
Chairman.

Peoria, Ill., Oct. 11, 1895.

PEORIA, ILL., Oct. 1, 1895.

To City Engineer:

DEAR SIR—At the annual meeting of the Illinois Society of Engineers an Surveyors, held at Monmouth, January 23-25, 1895, the lack of uniformity in the requirements of different specifications for paving brick and sewer pipe was discussed, and a special committee on "Standard Specifications and Tests of Paving Brick and Sewer Pipe" was appointed to investigate the subjects and recommend to the society standard specifications and tests. This committee is now endeavoring to obtain the views of various engineers and manufacturers throughout the country upon these matters, and would ask you to kindly answer the following questions, giving full reasons in every instance for the recommendations you offer, and transmit same as soon as convenient to the chairman:

What are your specification requirements for the following points on paving brick:

1. Size?
2. Per cent. variation in size?
3. Kind of shale or clay manufactured from?
4. Absorption?
5. Crushing strength?
6. Loss by abrasion in rattler, with details for making tests?
7. Transverse strength?
8. Amount of lime allowable?
9. What recommendations would you suggest regarding changes in the above requirements, with reasons for same?

What are your specification requirements for the following points regarding earthenware sewer pipe?

10. Thickness of body for different sizes?
11. Per cent. variation from regular diameter?
12. Standard length of pipe?
13. Depth of socket?
14. Annular space required in the sockets of the various sizes?
15. Strength required by different sizes?
16. Maximum and minimum sizes of pipe used by your city?
17. What recommendations would you

suggest regarding changes in the above requirements, with reasons for the same?

Kindly forward also the results of all tests which you may have upon paving brick and sewer pipe. Yours truly,

A. D. Thompson, Chairman.

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PEORIA, ILL., Oct. 11, 1895.

To ———, Paving Brick Manufacturer:

GENTLEMEN—At the annual meeting of the Illinois Society of Engineers and Surveyors, held at Monmouth, January 23 to 25, 1895, the lack of uniformity in the requirements of different specifications for paving brick and sewer pipe was discussed, and a special committee on "Standard Specifications and Tests of Paving Brick and Sewer Pipe" was appointed to investigate the subjects and recommend to the society standard specification and tests. This committee is now endeavoring to obtain the views of various engineers and manufacturers throughout the country upon these matters, and would ask you to kindly answer the following questions, giving full reasons in every instance for the recommendations you offer, and transmit same as soon as convenient, to the chairman:

What recommendations would you suggest regarding the following points upon paving brick:

1. Standard size?
2. Kind of material from which manufactured?
3. Vitrification?
4. Tests necessary to determine quality—
   (a) Absorption?
   (b) Abrasion?
   (c) Transverse strength?
   (d) Crushing?
   (e) Grinding?

A full discussion is desired of the tests necessary to determine the quality, together with the methods for making same, and the results which should be required.

Yours truly,

A. D. Thompson, Chairman.

—

PEORIA, ILL., Oct. 11, 1895.

To ———, Sewer Pipe Manufacturer:

GENTLEMEN—At the annual meeting of the Illinois Society of Engineers and Surveyors, held at Monmouth the latter part of January, 1895, the lack of uniformity in the requirements of different specifications for sewer pipe and paving brick was discussed, and a committee on "Standard Specifications and Tests of Paving Brick and Sewer Pipes" was appointed to investigate the subjects and recommend to the society standard specifications and tests.

This committee is now endeavoring to obtain the views of various engineers and manufacturers throughout the country upon these matters. We are especially desirous of obtaining the views of manufacturers, and would ask you to kindly give what information you can upon the points mentioned below, giving full reasons in every instance for the recommendations you offer, and transmit same to the chairman as soon as may be convenient.

What recommendations would you suggest regarding the standard thickness of sewer pipe of various sizes, quality of material, whether vitrified or not, the best depth of sockets to be used on the different sizes of pipe, and best length. Also your opinion as to the value of testing sewer pipe, and what tests you would recommend.

Yours truly,

COMMITTEE ON STANDARD SPECIFICATIONS FOR SEWER PIPE.

A. D. Thompson, Chairman, Peoria, Ill.
J. W. Alvord, 1140 The Rookery, Chicago, Ill.
J. R. Hanna, Monmouth, Ill.

—

CHARGES FOR STREET OPENINGS.

The prices charged for street openings in unpaved streets and in streets paved with macadam on and after October 1, 1895, in Yonkers, N. Y., will be as follows:

UNPAVED STREETS.

Permit for sewer connection, good for five days	$3 50
Permit for water connection, or for repairs to water or sewer pipes, good for five days	3 00

MACADAM STREETS.

Permit for sewer connection, good for five days	5 00
Permit for water connection, or for repairs to water or sewer pipes, good for five days	5 00

Extensions of time will be granted as required, at the rate of 50 cents for each additional day exceeding the five days' limit.

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STATISTICS ON PAVING BRICK AND SEWER PIPE.

From advance proof sheets of the report on The Mineral Resources of the United States in 1894," courteously sent us by the Director of the Geological Survey, the following statistical information is obtained on the paving brick and sewer pipe industries of

the United States in 1894, compiled by Jefferson Middleton:

States.	Vitrified paving brick.		Average price per thousand	Sewer pipe. Value.
	Quantity.	Value.		
	Thousands.			
Alabama	150	$1,500	$10 00	
Arizona				
Arkansas	705	7,050	10 00	$10
California	110	2,150	19 55	102,950
Colorado	2,188	21,880	10 00	50,000
Connecticut	10	250	25 00	15,000
Delaware				
Dist. of Columbia	250	2,000	8 00	61,100
Florida				
Georgia				47,300
Idaho				
Illinois	109,700	843,217	7 69	308,963
Indiana	23,936	224,473	9 38	1,000
Iowa	45,488	376,951	8 29	58,000
Kansas	7,948	57,310	7 21	
Kentucky	6,256	51,389	8 21	15,000
Louisiana	1,200	9,400	7 83	
Maine	1,650	11,200	6 79	390,000
Maryland	50	470	9 40	20
Massachusetts	1,854	14,530	7 84	
Michigan	145	1,560	10 76	99,040
Minnesota				543,065
Mississippi	110	770	7 00	
Missouri	23,189	190,220	8 20	150,000
Montana				7,200
Nebraska	5,700	52,800	9 26	
New Hampshire	700	4,900	7 00	
New Jersey	400	6,000	15 00	137,977
New Mexico				
New York	9,304	136,697	14 69	10,000
North Carolina	125	888	7 10	21,000
North Dakota				
Ohio	118,329	928,948	8 20	3,311,895
Oklahoma*	100	1,000	10 00	
Oregon	1,550	21,000	13 55	
Pennsylvania	74,029	521,359	7 04	347,202
Rhode Island	3,000	33,600	11 20	
South Carolina				
South Dakota				
Tennessee	7,687	39,384	5 12	75,000
Texas	1 0	1,000	10 00	2,000
Utah	1,575	12,863	8 17	2,000
Vermont				
Virginia	5,400	52,750	9 77	
Washington	1,024	17,600	17 19	209,000
West Virginia	8,059	63,964	7 94	350,000
Wisconsin				
Wyoming				
United States	457,021	3,711,073	8 12	6,314,722
Per cent. of Total		5.68		9.66

*Includes Indian Territory.

The average value of the vitrified paving brick was $8.12 per thousand, ranging from $5.12 in Tennessee to $25 in Connecticut.

The following table shows the average value of the vitrified paving brick, arranged in the order of the value per thousand in the several States:

States.	Price per Thousand.
Connecticut	$25.00
California	19.55
Washington	17.19
New Jersey	15.00
New York	14.69
Oregon	13.55
Rhode Island	11.20
Michigan	10.76
Alabama	10.00
Arkansas	10.00
Colorado	10.00
Oklahoma	10.00
Texas	10.00
Virginia	9.77
Maryland	9.40
Indiana	9.38
Nebraska	9.26
Iowa	8.29
Kentucky	8.21
Missouri	8.20
Ohio	8.20
Utah	8.17
District of Columbia	8.00
West Virginia	7.94
Massachusetts	7.84
Louisiana	7.83
Illinois	7.69
Kansas	7.21
North Carolina	7.10
Pennsylvania	7.04
Mississippi	7.00
New Hampshire	7.00
Maine	6.79
Tennessee	5.12
Average for United States	$8.12

NEW PUBLICATIONS.

A second edition of "How to Drain a House," by Col. Geo. E. Waring, Jr., street-cleaning commissioner of New York, has been issued by the D. Van Nostrand Co., of New York. Notes at the end of each chapter relate to the progress made in different branches of the work since the publication of the first edition, making it an up-to-date treatise of the subject of great practical value. The concluding chapter on sewage disposal is notably timely and interesting. The price of the book is $1.25.

Two interesting features of the meeting of the Canadian Society of Architects at Quebec, on October 2d, have very properly been preserved in printed form, one being

the cordial and happy welcome address of the retiring president, Mr. C. Baillairge, and the other an address by Mr. Baillairge on the subject of "Bribery and Boodling, Professional Charges and Pecuniary Ethics," in which he reviews somewhat questionable practices coming under his observation during his long and honorable experience in charge of public works.

Fourteen articles on the subject of vitrified paving brick by H. A. Wheeler, the clay specialist of the Missouri Geological Survey, have been published in a volume of eigty-four pages by T. A. Randall & Co., Indianapolis. The articles treat of the history of paving brick, definition of vitrified brick, clays, composition of paving brick shales, physical property of clays, manufacture of paving brick, physical qualities of paving brick, method of testing brick, uses of vitrified brick, comparison of street-paving materials, size, foundations, durability and cost of paving brick. The price of the volume is $1.

The need of a text-book on the law of contracts and engineering specifications has been met by the publication of a thorough treatise of the subject by Prof. J. B. Johnson, of Washington University, in a volume entitled "Engineering Contracts and Specifications." Professor Johnson has carefully studied the subject, in a way combining the various branches of technical knowledge most helpful to the seeker of reliable information, and his book is sure to rank as a standard authority. It is invaluable to civil engineers, architects and contractors. In addition to the essential legal information regarding contracts, model forms of specifications for all kinds of contractural work are set forth, and the book is in itself a whole library for the correct guidance of the business and professional classes for whose use it is intended. The volume comprises 420 pages, and the price is $4 per copy. It is published by the Engineering News Co., of New York.

MUNICIPAL REPORTS.

Cincinnati, O.—The annual report of the board of administration contains a report of each of the ten departments under the direct supervision of the board. One of the most important recommendations made by the board is a new water-works plant.

Chicago, Ill.—The last annual report of the chief of the street department gives the total miles of streets within its corporate limits as 2,488.97, of which 1,086.44 miles have been improved. Of this 65 per cent. is cedar block, 30 per cent. macadam, and 2 per cent. each of asphalt and granite blocks. The total expenditure for the year for streets, including sidewalks, is $3,000,000. Of sidewalks under the control of the city, 3,654.85 miles are wood, 257.67 miles of stone, and 511.18 miles of concrete. The report says of wooden walks: "They are a source of constant danger, and necessarily involve great expense upon the city for their maintenance, and during summer time, in outlaying districts, are oftentimes consumed by fire in large quantities."

Pittsburg, Pa.—The report of Samuel Paisley, superintendent of the bureau of highways and sewers, shows that the street paving for this year was begun as early in the season as the weather permitted, and, with four trifling exceptions, is finished. In all, twenty-eight streets have been paved at a cost of

$155,825, which is less than the appropriations made. The streets were paved with block stone with the exception of three which were paved with asphalt.

PERSONALS.

Governor Werts named City Surveyor Wise as one of the New Jersey commissioners to the national road parliament held in connection with the Atlanta Exposition.

Keepers & Thacher, consulting engineers and contractors at Detroit, Mich., will succeed the firm of Keepers, Wynkoop & Thacher, which has dissolved partnership.

Walter M. Hay, C. E., has been elected city engineer at Muscatine, Ia., to succeed Andrew W. Gates who resigned to accept a position with the T. B. Townsend Construction Co.

William A. Pike, consulting engineer and one of the best authorities on civil engineering in the West, died at his home in Minneapolis, Oct. 13. He was for years at the head of the engineering department of the University of Minnesota. Prof. Pike was a graduate of the Boston Institute of Technology.

Mr. John Craft, councilman from the fourth ward in Mobile, Ala., while on a recent visit to St. Louis, Indianapolis, Chicago, Pittsburg, New York, Philadelphia, Boston and other cities, made close observation of the sewerage systems in the different cities.

Prof. U. W. Wise, father of Mr. Colin Reed Wise, city surveyor of Passaic, N. J., and of Mr. Henry A. Wise, chief engineer of the Kansas City Stock-Yards Company, of Kansas City, Mo., died at Kansas City, on Sept. 28th last, at the age of eighty-two.

Henry M. Dowd, alderman at Orange, N. J., has handed in his resignation from the common council, to become a partner in the firm of Thomas Dowd and Florence McCarthy, who have been awarded the contract for sewers in the first ward of Orange.

During the illness of Director-General E. C. Lewis, W. F. Foster, M. Am. Soc. C. E., has been made acting director-general of the Tennessee centennial exposition. Construction is progressing actively, with Walter G. Kirkpatrick, Assoc. M. Am. Soc. C. E., as engineer in charge.

ANSWERS TO QUESTIONS.

[By J. W. Howard, B. L., C. E., for PAVING AND MUNICIPAL ENGINEERING.]

Can sandstone be used for curbs and gutter stone? *Benjamin.*

As a rule, no, and only when none other can be had. Most sandstones, when split, leave the grain turned up and water enters and splits and disintegrates the stone. Hard sandstones do not permit of being cut into curbs. Some cities using poor curbs do not know what good ones really are and the pleasure and economy of good curbs in straight alignment.

Why have the wood pavements in Mobile, Ala., failed so soon? *Consul.*

Because of the excessive rain upon blocks which were set close together when dry, they have expanded and left the foundation and

formed themselves into lumps and arches which do not go back to place.

Is a hard wood to be preferred for wood paving? *Mil.*

Not when wood pavements are laid as at Chicago or Milwaukee from round blocks on end. Water and rotting destroy the pavement, as much as traffic where wood pavement is thus laid. But where blocks are squared, laid on concrete, as in London and Paris, and where the joints are small and filled with cement grout or pitch, then hard pitch pine and even hard woods are good. Of course, wood pavements must not be neglected, but need constant attention and repair.

What is the steepest grade for which asphalt pavement is suitable? *West.*

About 4½ feet rise in 100 length is the usual maximum grade. But where a city like Washington or Buffalo has each more than 100 miles of this pavement, then the horses become so used to it that even steeper grades are used—*e. g.*, in Washington there are many places where a 7 per cent. grade is paved with asphalt pavement. Rock asphalt or asphaltic limestone pavements, because of the lack of sand in them, are a little more slippery than the asphalt pavements where sand is used in the mixture. Of themselves they may not be more slippery but in in actual use, with the little moist film of dirt, when wet, on a street, the rock asphalt pavements are a little more slippery and should be confined to grades of less than about 3 per cent.

Should stone crosswalks be used with brick pavements? *A. H.*

No, not as a rule, for the brick pavement can be so laid that no stone crossing will be needed anywhere touching it or across a street paved with brick.

Has the color of a paving brick anything to do with its quality? *Vidior.*

No, but various colors from the same kiln denote a variation in product and should be subjected to tests.

Here in Reading, Pa., we call that which is on the foot or sidewalks, pavement. Is it correct?

The word "pavement, is used in almost all cities in the world with slight variation in different languages to denote the structure on the street where vehicles and animals pass. We can use the word pavement for that which is on floors, courts, areas, sidewalks, but it generally, where used alone, refers to the roadway of a street.

Why are the gutters in Spanish American cities so often in the center of the street? *L. L.*

Because the streets are so narrow, and because the water from sidewalks, house roofs, and too often other water and offal are thrown in the street, and with one gutter in the center, all this is more easily washed away by rains, but sometimes swept away. Where vehicles are used, center gutters are very bad, and the larger cities in Mexico and South America are rebuilding and widening their streets, slowly, but on proper lines and plans.

Which is of the most importance—the kind of asphalt used, or the skill in its use in a pavement? *Experimenter.*

Both are of equal importance. If anything, greater care is needed in selecting the kinds of asphalts, sand, limestone dust, than in the exact mixtures and temperatures to be used, and the skill in laying and rolling it.

Are contracts with guarantee maintenance clauses truly economical for a city? *Mayor.*

Experience has taught all large American and European cities that it is economical to require maintenance or guarantee clauses. Where "politics" are mixed with the stone or other materials used in paving, no city is safe without a guarantee or maintenance clause for, say five years at least, and a good bond or cash retained by the city to make the guarantee good.

Are deferred payment plans good for street paving? *Comptroller.*

Yes. First: The city or property holder should be given time, say five years, to pay for new pavements, with a very low rate of interest. Second: The contractor should receive corresponding due-bills, or warrants, due one each year, for, say, five years. Third: The pavement should be guaranteed for at least five years. Because there is so much new pavement needed in our rapidly growing cities, the above seems the only just and easy way to get the pavements which are to serve us and those to follow us.

What price is reasonable for asphalt floors for a cotton mill in the South Eastern part of the United States? *Builder.*

It should be laid about ¾ inch thick, on wooden floors, specially arranged not to "dry-rot," and would cost for first-class work from 16 to 20 cents per square foot, depending upon the amount to be done, and the accessibility of the floor space due to the presence of more or less machinery. The best asphalt floors, on all stores, would be from a standard rock asphalt mastic, of which there are two or three reliable brands. Such floors, when well laid, are almost everlasting.

LEGAL DECISIONS.

[Reported specially for PAVING AND MUNICIPAL ENGINEERING.]

Liability for Defect in Street.—When a street railway company obtains a franchise from the city, agreeing to keep its tracks at proper grade, and an accident happens through its failure to do so, for which the city is liable in damages, the company is liable over to the city. City of Fort Worth *v.* Allen (Court of Civil Appeals of Texas), 31 S. W. Rep. 235.

Liability for Explosion of Gases in Sewer.—In an action against a city for damage caused by the explosion of a public sewer, it appeared that petroleum which had been allowed to run into the sewer under the direction of the chief of the city's fire department could not flow out by reason of the high water in the river at the outlet of the sewer; that it was in the sewer for four days, and generated gases, which could not escape because the manholes were kept closed; and that the gases were accidentally ignited, causing the explosion. It was held, that the question of the city's negligence was for the jury. Fuchs *v.* City of St. Louis (Supreme Court of Missouri, Division No. 1), 31 S. W. Rep. 115.

Liability of Water Companies.—A water company is not liable to the owner of private property destroyed by fire through failure to furnish

water to extinguish fires under a contract between itself and a city. House *v.* Houston Water-Works Co. (Supreme Court of Texas), 31 S. W. Rep. 179.

Taxation of Machine for Breaking Stone.—A machine for quarrying and breaking stone for macadamizing roads and similar purposes, is not employed in a branch of manufacture within the statute providing that all personal property shall be assessed to the owner in the city or town where he is an inhabitant on May 1st, except all machinery employed in any branch of manufacture, which shall be assessed where it is situated or employed. The business of quarrying stone and breaking it up for use on roads and other similar purposes, can not be deemed a manufacturing business any more than mining coal and breaking it up into merchantable sizes, or farming and cutting ice.

Quarrying and dressing granite could hardly be said to be manufacturing it, though moulding clay into different sizes and shapes and then burning it fairly may be said to be manufacturing brick. Still less could simply crushing granite into smaller and smaller pieces be said to constitute manufacturing, as that word is ordinarily used, though there is a remote sense in which it may be true. Wellington *v.* Inhabitants of Town of Belmont (Supreme Judicial Court of Mass.), 41 N. E. Rep. 62.

CEMENT DEPARTMENT.

AMERICAN AND FOREIGN PORTLAND CEMENTS.

The comparative excellence of American and foreign Portland cements is a much discussed topic, and sweeping statements are sometimes ventured on both sides of the question. We occasionally hear of instances where American Portlands are either avoided entirely for important work, or are used with a smaller proportion of sand than is allowed with the best foreign cements. These cases indicate that, whatever may be the character of the American product, its reputation among some engineers is not all that might be desired.

There are many places in the United States where the raw materials for Portland cement manufacture are found in large quantities and of excellent quality. The carbonate of lime occurring in the form of marl is particularly well adapted to cement making on account of the ease of working. Our machinery is unsurpassed; our laborers are capable of doing more work than foreign laborers do, and we have no lack of men who may readily be trained to do the necessary amount of skilled labor if properly superintended. The quality of the cement, then, must hinge on the ability of the superintendent or manager, and in order to insure a uniformly good product this position should be filled by a competent cement chemist. The mixture of the raw material should be submitted to a partial analysis very frequently and the making of proper changes in the manufacture to obviate certain defects in the finished product is a matter requiring scientific consideration. In fact, Portland cement can not be successfully made by "rule of thumb" methods and the earlier this fact is

appreciated in this country, as it is now in Germany, the better will it be for the Portland cement industry of the United States.

Some of the American manufacturers have secured expert supervision of their works and are making cement that is equal to any foreign cement that we receive. These manufacturers are glad to have their cement tested in comparison with foreign brands, because they believe that such tests will contribute largely toward removing the prejudice existing against the American product. That this end is being attained is evidenced by the increased production, and we may confidently hope that in the near future American Portlands will take their proper place at the top of the scale of excellence.

DETAILS OF THE SIMPLER TESTS OF CEMENT.

By L. C. Sabin, M. Am. Soc. C. E.

I.

A comparatively small portion of the cement used in the United States is submitted to tests, yet we seldom hear of failures in engineering work that can certainly be traced to the use of poor cement. The reason of this is not far to seek. Cement is used in such a crude manner—with such a large factor of safety—that it must be of very poor quality, or very badly handled if it fails in use. But this furnishes a valid excuse neither for omitting the tests, nor for slighting the manipulation.

Although it is not an easy matter to be able to invariably detect a poor cement or recognize a good one, yet considerable useful information may be quite easily obtained. It is the object of this paper to explain in detail some of the simple tests that may be readily applied, and it is therefore written especially for those who are neglecting to make tests because much time and extended apparatus are thought to be requisite.

The beginner should not endeavor to make close comparison, between his results and those of other experimenters. When making tests of a brand which it is proposed to use in the work, let him for purposes of comparisons make parallel tests with samples of several other brands which are considered to be of first quality. If none of the samples give satisfactory results it is probably due to faulty manipulation, and the experimenter should carefully review and correct his methods before repeating the work.

In these short articles the writer will not attempt to follow the logical sequence of tests, but will begin with one that requires almost no apparatus, while its importance is seldom questioned. This is the

TEST FOR SOUNDNESS.

The object of this test is the detection of the changes in volume of the cement during induration, which result from improper proportions or other defects in the manufacture, and which cause deterioration or even complete disintegration.

The most frequent cause of unsoundness is considered to be the presence of free lime, or magnesia. On account of the high temperature at which cement is calcined, weeks or months of exposure in the packages may be required to correct tendencies to expand due to the presence of these constituents. When mortars from such defective cements are immersed in water of ordinary temperature the expansion may not occur for a considerable period. This fact has led to

the use of hot tests of various kinds to detect such faults, but before touching upon any of these so-called "accelerated tests" the ordinary cold water test will be described.

Some neat cement mortar being prepared of about the consistency of mason's mortar, two or three cakes, about three inches in diameter and having thin edges, are molded on small glass plates. These cakes should be placed in moist air (in a flat pan covered with a damp cloth) and, when they will withstand a moderately hard pressure of the finger nail, one of them should be immersed. A second one may be immersed about three hours later, and the third one 24 hours after made. These pats should not warp, or crack at the edges, and if the cement is perfect the pats will adhere to the glass. Should the pat first immersed fail by developing a network of cracks on the surface, or by scaling, it is probably caused by too early immersion. If during the time of setting the mortar is subjected to dry air, drafts or sunshine, shrinkage cracks are liable to occur; but these will be found in the central part of the cake and should not be confounded with expansion cracks, which occur at the edges and follow radial lines. The use of too much water in gaging the mortar will increase the liability to contraction cracks.

It is not usually possible to hold cement longer than seven days awaiting the results of tests. If a cement is decidedly bad, it will generally show signs of failure in this test in a few days, but if it is only poor, failure may not be apparent for several weeks. The "hot test," which is designed to give quicker results, will be described in a subsequent number.

HOW FINE SHOULD CEMENT BE GROUND?

Mr. Cecil B. Smith, an associate member of the Canadian society of civil engineers, in a recent article in the *Canadian Engineer*, remarks that there is probably no test of Portland cements on which the lines are being drawn tighter than that of fineness. "Not many years ago," he says, "10 per cent. residue on a No. 59 sieve was satisfactory; then 5 per cent. on the same sieve was demanded, until now-a-days our societies are demanding a cement which will laugh at a No. 50 sieve, and escape with only 10 per cent. vanquished by a No. 100 sieve. Of course those who study the nature of cements know that the finer the better, other things being equal and the demand for fineness is largely justified. * * * Cements, are used in such numerous ways for such various purposes that hard and fast rules can hardly be laid down; instead, let us rather try to have all engineers so posted on the subject as to enable them to use proper judgment in selecting various grades for differet purposes. For instance, if we wish to fill water-pipe joints with cement mortar, we have Mr. Coffin's experiments to show that a 1 to 1 mixture will allow less percolation by water under pressure than either a richer or leaner mixture, and certainly, a very ordinary coarse English or Belgian Portland will be amply strong for the purpose. Again, German and English experiments show that the maximum efficiency for abrasion in sidewalks, etc., is that of a 1 to 1 mixture, and a very coarsely ground Portland will do for this; while, where strength pure and simple is needed, as in concrete and heavy masonry, the economy of fine grinding can be fully realized.

"As to where we are going to stop in our demands it is hard to say, but it is almost certain that, until a larger percentage of our engineers and architects actually demand certain fineness, see that their demand is carried out and satisfied, and make such demand intelligently, *i. e.*, with a knowledge that fineness must be paid for because it costs money to grind fine, and are willing to pay for it, instead of buying a coarser article, because it can be had 15 or 20 cents per barrel cheaper; until this time comes—and it is not here yet—we shall not give the encouragement that we ought to those manufacturers who give us finely ground cement."

Mr. Smith thinks that Germany is in the lead in fine grinding, but he also loyally claims much for the manufacturers of his own country.

LETTERS FOR THE PUBLIC.

LOST BUT NOT FORGOTTEN.

To the Editor of Paving and Municipal Engineering:

I observe in your last number of PAVING AND MUNICIPAL ENGINEERING that Syracuse is credited with a city engineer by the name of Henry Collar, and this morning I received a circular from you addressed Henry Collar, president common council. I wish you would correct the impression that you have sent abroad that some one other than myself is city engineer of Syracuse. Our president of common council, Robert Ballard, and myself, attended the Cincinnati convention, duly enrolled our names (legibly, I believe), and joined the society. In some manner our identity has become lost, and we seek to be restored to the knowledge of men in our true personality.

Henry C. Allen,
City Engineer.

Syracuse, N. Y., Oct. 6.

BURNING OUT ASPHALT WITH MOLTEN GOLD AND SILVER.

To the Editor of Paving and Municipal Engineering:

Following you will find an item which, believing it to be the only case of the kind extant, I take pleasure in giving you for publication:

Two years ago The Grant Paving Company of this city laid a quantity of asphalt pavement at the plant of the Omaha and Grant Smelting Company. In doing some slight repairing, it was found necessary to cut out a square yard or so, and repave the same. Adjoining the pavement was a furnace room from one of the furnaces, out of which sufficient molten gold and silver was taken to burn out the required patch in the pavement. I believe this to be the first time on record where gold and silver have been used for such purpose. The amount used was valued at several thousand dollars.

When the pavement was burned out, the whole mass of gold, silver and asphalt was again refined.

R. F. Gilder.

Omaha, Oct. 4.

THE INSTITUTE OF CLAYWORKERS OF LONDON.

THE INSTITUTE OF CLAYWORKERS,
222 STRAND, LONDON, W. C.,
11 October, 1895.

To the Editor of Paving and Municipal Engineering:

As no doubt you know, the above institute is in active operation, we are very anxious to get a good collection of bricks, etc., of American manufacture to be included in our

exhibition here of bricks of all nations and shall be glad if you can assist us in any way in obtaining what we want.

We would like you to let your readers know of the formation of this institute here and would be pleased to see any of them, who happen to be at any time on this side of the Atlantic, and if they will give us a call we shall be happy to show them what is being done in the trade in this country.

Geo. W. Callender, Hon. Sec.

SELECTIONS FROM THE PRESS.

A NEW DISEASE IN LONDON CAUSED BY STREET DETRITUS.

The Hospital published in London, states that the dry weather acting on wood paving has introduced the harrassed Londoner to a new disease. It is a kind of malady not unlike "hay fever." The membrane of the nose becomes inflamed and thickened, the blood vessels turgid, and on a very slight provocation there follows copious bleeding. The whole mischief is attributed to the *debris* of the dessicated wood paving and street refuse.

CHEAP PAVING STONES.

Notwithstanding the fact that the shipment of paving stones last year was larger than ever before, it is alleged that there is now an overstock of some six million blocks awaiting purchasers at Pigeon Cove, and that an order to dispose of the stock on hand and freeze out the small competitors, one of the strongest entrenched of the old companies has resolved upon a rate-cutting war, and will reduce prices already lower than ever before, some $10 per thousand.

The motion men, it is claimed, are viewing the situation coolly. They say that if any one wants to sell paving brick away below the cost of production that the field is open.

The thing can not last forever, no matter how strong may be the company financially and when prices go up again the motion men will be in the game.—*Newburyport, Mass., News.*

LONDON LAUGHS AT SAN FRANCISCO.

There is no gainsaying the fact that America is the land of the unexpected, of the astounding. We just learn that San Francisco has invented a decidedly unique way of filling its coffers and getting rid of difficult work, while indirectly draining the pockets of the citizens. Briefly, the city sells the duty of removing and disposing of house refuse to the highest bidder, who recoups himself for the sum paid to the city and the cost of the work by charging householders a certain sum for every cubic yard of refuse removed! The actual contractor charges ten cents per cubic foot, but as the contract is running out, the city advertised for new tenders for doing the work for thirty-five years. The result has been that one company offers to cremate all refuse, pay two hundred and twenty pounds for the privilege, and extract twenty cents per cubic yard of refuse removed from the premises of unfortunate householders. Another offers four hundred pounds down and about one hundred and forty-nine pounds a year, demanding from the householder twenty-five cents per cubic yard. They undoubtedly have peculiar notions about government 'Frisco way!—*From The Surveyor, of London.*

ADVANTAGES OF MURPHY'S GROUTING FOR BRICK PAVEMENTS.

Regarding the Murphy grouting, which will be used in laying brick pavements in Kansas City, Mo., the *Journal* says:

The brick paving industry of Kansas City is likely to receive a very significant impetus, from the arrangements made by the Diamond Brick and Tile Company for the use of the Murphy grout, manufactured by John Murphy & Co., of Columbus, O.

Whatever dissatisfaction has hitherto existed from the use of brick paving, seems to have been a result of the lack of adhesive quality in the material placed between the bricks. Even where the best of bricks have been used, heavy drayage has in time loosened the separate parts. It would seem that the secret of complete satisfaction has at last been solved by John Murphy, who has been in the street paving business for thirty-three years, and has been experimenting in grouting for thirteen years.

The material which he furnishes is manufactured at only one place in the United States, but has already created a big demand for itself. Mr. Murphy conducted his experiments in various ways, concluding them in the furnaces of the chemical department of the Ohio State University, at Columbus. It is said, not only by Mr. Murphy, but by others who have investigated the paving done by this grouting, that the material gains adhesiveness with age, and that it is stronger after several years' service than at the beginning.

Mr. J. W. Barney, president of the Diamond Brick and Tile Company, said yesterday that his company had made arrangements for the use of the Murphy grouting. "We have so much confidence in the efficacy of this new material," said Mr. Barney, "based upon my visit to Columbus, where I inspected pavements of various ages, that we have arranged to use it entirely in our work in Kansas City. We purpose to repave Main street between Twelfth and Nineteenth streets at our own expense, merely as an advertisement of the new grouting. Although this paveing is not in bad condition, we shall select this particular street, and charge the property-owners nothing for the work, because we want to get our sample paving conspicuously before the public. We believe that when the people of Kansas City once learn the advantages of this new grouting—which will add at least one-third to the life of brick paving—there will be a strong turn in favor of this material for street improvements."

RECENT INVENTIONS.

[Reported specially for PAVING AND MUNICIPAL ENGINEERING by A. I. Gardner, Washington, D. C.]

On October 1, 1895, the United States Patent Office issued 426 patents, 10 designs and 24 trade-marks, making a total issue of 460. The following will be of interest:

547,005. *Earth-Excavator*. W. H. Finlayson, Sydney, New South Wales. The excavator comprises a truck composed of a frame adapted to carry all of the operating devices, together with the motive power therefor, drive-wheels and their axle from which said frame is pivotally suspended about midway of

its length, and means for elevating and lowering and tilting the frame on said wheel-axle.

547,024. *Short or Bank Protector and Apparatus for Constructing and Placing Same.* D. Neale, Fort Calhoun, Nebraska. This is the combination of a series of pairs of warp-lines embracing laterally extending mats of disintegrate fibrous filling, and a lateral binding cable coiled around the warp-lines between the mats.

On October 8, 1895, the United States Patent Office issued 352 patents, 18 designs and 22 trade-marks, making a total issue of 392. This is a decrease of 68 compared with last week's issue.

547,528. *Overhead Bicycle Railway.* H. B. Weaver and H. S. Phillips, Burlington, N. J. In an overhead bicycle railway, the combination with the track-wheels and frame suspended beneath the track, of bearings for said wheels, said bearings supporting horizontally the journals adapted to lie to one side of the track and of the wheels, and vertical journals on which said wheel-bearings are rotatable.

On October 15, 1895, the United States Patent Office issued 410 patents, 17 designs and 6 trade-marks, a total issue of 433. This is an increase of 41 over the issue of last week.

547,840. *Machine for Making or Repairing Roads.* M. G. Bunnell, Chicago, Ill. In a machine for making and repairing roads, the combination with the scraper-blade and draft-bar, of the plate provided with the seat for the forward end of the draft-bar and bolted to the latter, a yoke swiveled to the plate, a sleeve pivotally held by the king-bolt and hinge-connection between the yoke and sleeve.

547,841. *Wheeled Dumping-Scraper.* M. G. Bunnell, Chicago, Ill. A bowl is suspended from the axle by a crank movement, the draft-attachment pivoted to the bowl and having a rear extension, raising and lowering levers pivoted to the bowl, and plates provided with cams and adjustably held upon the raising and lowering levers.

548,066. *Street Sweeper.* W. S. Kindle, Philadelphia, Pa. A sweeping machine having a frame, a movable broom-frame thereon, a broom carried thereby, a roller carried on the frame, chain gearing for driving said broom comprising a chain belt passing over said roller and geared to said broom and means for driving said chain-belt, a lever carried on the frame and a connection between the lever and roller.

On October 22, 1895, the United States Patent Office issued 454 patents, 23 designs, and 3 re-issues, making a total issue of 480. This is an increase of forty-seven over the issue of last week.

548,271. *Road Machine.* H. Poucher, Brooklyn, Mich. A road machine comprising the combination of a frame, a bar mounted thereon, a block secured to the bar and adjustable laterally thereon, and a scraper secured to the block and adjustable axially on the block, the engaging faces of the block and scraper being correspondingly ratcheted.

548,200. *Street Sweeper.* C. Hvass, New York, N. Y. The combination with a brush supporting frame, of a lifting lever connected thereto and means for securing the lever in an adjusted position consisting of a slotted standard secured to the main frame, provided with a slot having rack-teeth on each side of said slot a screw bolt carried by

the lever and passing then through and in a slot of the standard, a nut applied to the bolt to clamp the head of the bolt against the rack-teeth of the standard.

548,413. *Electric Arc Lamp.* T. E. Adams, Cleveland, O. In an electric arc lamp, the combination with the carbon, as coarse wire magnet and an armature for said magnet, of a switch and a resistance connected in series with a part only of the helix of the coarse wire magnet.

[Reported specially for PAVING AND MUNICIPAL ENGINEERING by Chandlee & Chandlee, Washington, D. C.]

541,546. *Road-Grader.* John Heuermann, Oak Park, Ill. Filed Sept. 29, 1894. Serial No. 524,-421. (No model.) In a machine of the class described, the combination with a truck frame having supporting and carrying wheels, of an independently movable scraper frame mounted thereon and having the scraper arranged diagonally thereof in front of the truck wheels and extending beyond the truck frame on the furrow side, and a land-side also external to the truck frame and means for raising and lowering the scraper frame with reference to the truck frame; a wheeled truck of substantially triangular form, a scraper frame having a scraper arranged diagonally thereof, the truck being adapted to enter the scraper frame and support the same, guides on the truck frame adapted to embrace the members of the scraper frame and lifting levers on the truck frame adapted to bear on the scraper whereby to elevate the latter.

541,808. *Scraper.* Clement E. Burbank, New York, N. Y. Filed Sept. 19, 1894. Serial No. 523,-436. (No model.) The combination, with the scraper, of the side brackets thereon, the hauling and hoisting bail arranged to slide on the brackets, from hauling to hoisting position, and latch devices by which to lock the ball in hoisting position.

541,848. *Apparatus for Laying Concrete on Inclined Surface.* Lewis Grant and Frank A. Mooney, Philadelphia, Pa. Filed Feb. 13, 1895, Serial No. 538,230. (No model.) In an apparatus of the character described, the combination of a frame made in two sections, having internally projecting beveled edges, adapted to be placed laterally along an inclined surface, and to be held from spreading by pegs driven into the earth along the sides thereof, and sectional lids or covers for said section, the said lids or covers being counter-sunk forming shoulders, which engage the inner edges of the said sections and adjustable means for securing said lids in place.

542,209. *Snow-Cleaning Machine.* Giovanni B. Siccardi, New York Mills, N. Y. Filed April 23, 1895. Serial No. 546,818. (No model.) A snow-cleaning machine, comprising the frame, the vertical side plates having offset portions, the guide roller within, said plates having the guide bars, fifteen extending inwardly therefrom with curved upper ends, the conveyer chain and means for operating the conveyer chain and guiding the same vertically between the side plates.

TRADE NOTES.

Vitrified brick are being manufactured in Kingston, Kan.

Flint, Mich., contemplates the purchase of a new stone crusher.

Lutes & Son, Montgomery, Ind., have begun the manufacture of brick.

Mack Bros.' brick plant, Muncie, Ind., was destroyed by fire October 25. Loss, $25,000.

The tests made of the clay found at Heron Lake, Minn., indicate that it is pottery clay of a very good grade.

T. Foster, Troy Grove, Ill., is prospecting for a rich clay bank, and, if successful, he will start new tile works.

R. E. Ross and C. Y. James, Chester, Pa., have bought the Law & Devaney mill and brick-yard in South Chester.

J. Elvin, Enterprise, Miss., will purchase fire-clay beds near Spring Hill, Mo., and will erect a manufacturing plant.

The Fort Smith Paving Brick and Fire Clay Co., of Fort Smith, Ark., has begun operations with a full force of employes.

Valuable clay lands have been purchased at Whippany, N. J., by a Morristown syndicate, and terre cotta works will be erected.

The capacity of the brick manufacturing plant of Ed Rankin, Watson Station, near McKeesport, Pa., is being increased five-fold.

The city of Quincy, Ill., has purchased a No. 4 rock crusher from the Austin Manufacturing Company, of Chicago, for $850.

A valuable shale deposit has been discovered on the mountain farm of L. G. Adsit, near Catskill, N. Y., and a test made of it resulted in a brick firm as iron and waterproof.

Johnson & Bell, Beardstown, Ill., contemplate establishing a new brick-yard, and will commence operations early in the spring.

The R. H. Hall Brick Company, Detroit, Mich., contemplates erecting works in Ecorse for one of the largest brick yards in the state.

The manufacturing establishment of the L'Anse Pressed Brick Co., L'Anse, Mich., will be supplied with the latest machinery.

The works of the Barnard Brick Co., Bellaire, O., are runing on full time and the prospects are good for them to continue through the winter.

The Saginaw Clay Company, Saginaw, Mich., has added two new kilns to its plant, and contemplates putting up ten more during the winter.

D. J. Kennedy, South Bay City, Mich., has the contract for constructing the roadbed between Saginaw and Bay City, for the Rapid Transit Co.

The Rochester Vulcanite Works, corner of S. Clinton and Alexander streets, Rochester, N. Y., were burned September 23. The buildings will be rebuilt.

The Frey-Sheckler Company, Bucyrus, Ohio, made a recent sale of machinery to the Dubois Brick Company, of Marion, Ind., for its factory at Greentown.

The property of the Peoria Paving Brick Co., Peoria, Ill., has been sold by the sheriff to E. Lammers and the Peoria Savings, Loan and Trust Co., for $5,440.

The Standard Fire Brick Co. has been incorporated to manufacture brick at Ottawa, Ill., by John W. Channell, Warren C. Riale, and Edward W. Bach.

The outlook for the clay industry in Brazil, Ind., for the next year is very encouraging, and additions will be built to many of the plants. The Chicago Sewer Pipe Company is building two 30-foot kilns, and contemplate building an addition to the south side of the plant in the spring.

Wilkinson & Stewart's brick works were destroyed recently by fire at Empire, Ohio. Loss, $20,000. The works of the Congo Firebrick Co. have also burned. Loss, $50,000.

The Canton Buff Brick Co. has been incorporated at Canton, Ohio, by the stockholders of the old Anchor Tile and Brick Co., with works at Sparta, and offices at Canton.

T. J. Melvine, manager of the Alumnia Shale Brick Company, Lewis Run, Pa., has devised a process by which he can manufacture red brick with buff ornamentation.

The John Porter Brick Works, located at Kenilworth, opposite Wellsville, O., have been sold. They were bought in by creditors for $14,000, about one-fourth their actual cost.

The Buchanan Bros.' Brick and Tile Company, which has been incorporated to manufacture pressed brick and tile at Buchanan, Mich., was organized by capitalists of Niles, Buchanan and Benton Harbor, Mich.

Mr. J. W. Robb, secretary of the Clinton Paving and Building Brick Company, informs us that the entire output of his company has been sold up to the end of the season. The excellent brick made by this company are in great demand.

The bids received September 28 for the machinery for the rock-crushing plant at Folsom, near Sacramento, Cal., were as follows: Union Iron Works, five bids, two for $19,250, and three for $15,000, $16,000, and $18,000; Pelton Water Wheel Company, $16,000 and $16,450; Risdon Iron Works, $7,693; American Road Machine Company, $11,630.

The Frey-Sheckler Company, Bucyrus, Ohio, equipped the brick plant of Martin Gibson, East Rye-yate, Vt., with a one hundred horse power boiler, a fifty horse power engine, a disintegrator pug-mill, and Giant brick machinery.

The Middleport Granite Brick Co., Middleport, Ohio, has been placed in the hands of a receiver. Assets are $77,000, and liabilities $40,000. The purpose of the receivership is to gain time in which to settle with creditors.

The Monmouth Mining and Manufacturing Co., Monmouth, Ill., has the contract for all the sewer pipe used in the sewerage system at San Antonio, Tex., which is being constructed by Wilding, Marshall, Backus & Hines, of Indianapolis.

J. M. Thurston, ex-minister to Honolula; Dr. Caldwell, of Chicago, and Dr. Eaton, Des Moines, Ia., made a recent visit to Michigan City, Ind., and purchased the Brice patent for the manufacture of brick, and a plant will be established in Des Moines.

An oil burner for bricks, the first if its kind to regulate the heat satisfactorily, has been invented by a brickmaker in Los Angeles, Cal., who says that while it costs from $1.75 to $2 to burn 1,000 bricks with wood, it only costs 60 to 70 cents with the oil burner.

Newly incorporated companies: Buchanan Bros.' Brick and Tile Co., Buchanan, Mich.; Asphaltum Block Paving Co., San Francisco, Cal.; directors, Alfonzo Haskins, John S. Kimball, Oakland; John H. Bullock, Loring B. Doe, Martin K. Landen, San Francisco; Standard Fire Brick Co., Ottawa, Ill.; Canton Buff Brick Co., Canton, O.

The next annual convention of the Illinois Clay-workers' Association, formerly known as the Illinois Brick and Tile Association, will be held in Streator, Ill., January 21 and 22, 1896. For further information, address G. C. Stoll, Sec'y, Grant Park, Ill.

The indebtedness of the Mt. Vernon Bridge Co., which passed into the hands of a receiver some months ago, has been paid on a compromise basis by some of the stockholders, and suits will be entered by them at once to collect from the other stockholders. The amount involved is about $100,000.

A seam of genuine fire clay, 10 acres long and 16 feet thick, has been discovered near Grand View, by C. Harris, of Paris, Ill. It has been tested and it is claimed that it has been found suitable for street paving, but Mr. Harris will probably erect a manufacturing plant.

The brick manufacturers of Toledo, O., are again considering the question of an organization. A prominent manufacturer claims that the business of none of the firms has paid lately, the price now being $4.50 in large lots; the average price is $5 to $5.25. The yards, fifteen in number, have all signed an agreement, and prices will probably reach $6.

The Weir Plow Company, Monmouth, Ill., will have new brick buildings. The plans provide for a two-story office building, 80 x 50; a warehouse 80 x 700; a paint shop 60 x 308, with a wing 56 x 165; an executing shop 200 x 75; a grinding shop 98 x 50; a blacksmith shop 252 x 50; a stock building shop 70 x 60; a wood shop 75 x 112; a machine shop 75 x 84; a foundry, milling and casting shop 300 x 75.

The State Mining Bureau has received from Summerland, Santa Barbara county, Cal., a specimen of porous asphaltum which is only half the weight of ordinary asphaltum of equal bulk. A very large deposit of the peculiar material has been discovered, and a question in the minds of the owners of the ledge is whether or not it is of any special commercial value.

Vitrified brick pavements, which have been so extensively favored in the west heretofore, are rapidly coming into prominence in eastern cities. Experiments are being made by a number of cities with a view to the adoption of the material if it proves successful, and their experiments are watched with interest by other cities. E. B. Winslow, of the Deering Pottery Works, at Portland, Me., is reported to be among the latest experimenters in the production of suitable brick for paving purposes.

The W. C. Leffel Company, Springfield, Ohio, manufacturers of turbine water wheels, has been reorganized and its name changed to the Trump Manufacturing Company. The officers of the reorganized company are: President, J. J. Hoppers; vice-president, Wm. Conklin; general manager, Fuller Trump; treasurer, Paul A. Staley; secretary, Percy Norton. The directors are Paul A. Staley, J. O. Hayward, Fuller Trump, Percy Norton, Horace C. Keifer, J. J. Hoppers, Wm. Conklin, Frank G. Bartholomew, G. P. Frank and J. L. Borger.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Cincinnati, O.—Asphaltic paving will be considered for the schools.

Mt. Vernon, N. Y.—E. Lincoln-ave. is being paved with Mack brick.

Milwaukee, Wis.—The vitrified brick pavement on Mason-st. is completed.

Mobile, Ala.—The paving of Commerce-st. with chert is under course of construction.

Wheeling, W. Va.—Brick paving is being put down on Sixteenth-st. by the Elm Grove railway company.

Little Falls, N. Y.—There is a growing sentiment in the city that Main-st., at least, should be paved with brick.

Council Bluffs, Ia.—The council has been urged to investigate the brick manufactured at Galesburg, Ill., for paving Pearl-st.

Philadelphia, Pa.—The Philadelphia traction company has declared its intention of repaving all around the city hall with the latest improved patent pavement.

New Orleans, La.—The property-owners on Ursulines-ave., from N. Claiborne to Broad, have decided to have their thoroughfare paved with Trinidad lake asphalt.

Middletown, N. Y., (Special)—Charles H. Smith, city engineer, writes that the brick paving on E. Main-st. and Wickham-ave., 10,790 square yards, was begun Oct. 3. The total cost will be $19,000.

Columbus, O.—A resolution has been adopted to the effect that hereafter all bids for street improvements shall contain the name of the brick or block used, the place it is made, and the name of the maker.

Springfield, Ill.—A lengthy list of streets have been paved and repaved during the last year with brick with satisfactory results. There still remains about fourteen miles of cedar block pavement which will be replaced with brick next year.

St. Augustine, Fla.—The board of aldermen decided, Oct. 10, that no more shells and sand shall be used to top-dress the decayed cypress blocks on St. George or any other thoroughfare, as it is a needless expenditure.

Allegheny, Pa.—The specifications for asphaltic paving are to be amended so as to allow competition. The public works committee returned to the bidders, Oct. 4, all bids for repaving with asphalt, Grant-ave., Juniata and Middle-sts., which action will prevent work on these streets before spring.

Minneapolis, Minn.—Press reports are to the effect that the plan to lay an experimental block of vitrified brick pavement has fallen through; that the cedar block pavements on nearly all of the down town streets are in a demoralized condition, and that the city council is nearly united on the subject of having the majority of the streets re-paved, probably with asphalt.

Bloomington, Ill.—During the last summer several thousands of dollars have been expended for the construction of pavements and sewer extension, which is looked on as only the beginning of next year's contemplated work, which will probably be the greatest in the history of the town in municipal improvement.

Philadelphia, Pa.—Director of Public Works Thompson has not yet decided whether or not he will utilize the entire $500,000 appropriation for repaving or use some of it for underground work on the streets to be paved. Petitions have already been received asking for repaving of about one hundred streets.

Black Rock, N. Y.—A proposition has been made by a paving company to repave Niagara-st. as follows: From Niagara square to Scajaquada creek, and from Hamilton-st. to the city line, it would lay asphalt on top of the present stone pavement, for $1.75 per square yard; if the people want the street widened, it will grade and pave the widened part with asphalt for $2.50 per square yard. The proposition is considered a good one.

Los Angeles, Cal.—The application for an injunction, brought by W. A. Field against Street Superintendent P. A. Howard and the city authorities to restrain them from entering into a contract with the Union paving company for the paving of Main-st., was dissolved by Judge Van Dyke, Sept. 23. The court holds that the contention that the proceedings had by the city council was not as required by law is not good, and regarding the principal contention by the plaintiff that the bid and bond of the paving company was not properly executed, he holds that they are sufficient.

Cincinnati, O.—Engineer Stanley reported favorably on testing the Mt. Airy, N. C., granite and the Lithonia, Ga., granite simultaneously, so as to see if the Mt. Airy specimen will stand an equal crushing power so as to be admitted to the city specifications. Twelve cubes of each granite will be used, and will probably be taken to the navy yards at Washington, where the same person will test both materials at the same time, under the same conditions, and with the same machines. This is the result of a protest made by the Southern granite company against the material used in Andrews alley, which it claims, is not up to specifications.

Portland, Ore.—After passing through an era of earthen streets, planked streets, Nicholson pavement, and macadam, this city has about come to the conclusion

that asphaltic paving approaches perfection more than any other tried material. One block of brick pavement, which had been laid two years, has worn well, and two blocks of brick pavement on a concrete base show no signs of wear, and there is a growing sentiment in favor of wood block pavements for streets above the high water mark, which makes it probable that wood blocks will be given a fair trial next spring. The Nicholson pavement wore well, although it was laid in a crude and imperfect manner.

CONTEMPLATED WORK.

Auburndale, O.—Paving is proposed for fifteen streets.

Hudson, N. Y.—The macadamizing of Main-st. is being agitated.

Champaign, Ill.—Asphaltic paving is contemplated for several streets.

Stockton, N. J.—About $10,000 will be expended for paving the intersections of streets.

Albany, N. Y.—Maiden-line, from Broadway to N. Pearl-st., will be paved with asphalt.

Chattanooga, Tenn.—Georgia-ave., between Vine and E. Fifth-sts., is to be macadamized.

Grand Forks, N. D.—The Commercial club will organize for street paving and electric lights.

Passaic, N. J.—(Special.)—Prospect-st., from Passaic-ave. to Main-ave., will be macadamized this fall.

Hartford, Conn.—A resolution for paving Main-st. with sheet asphalt was passed over the mayor's veto Oct. 14.

Pittsburg, Po.—An ordinance has been approved for paving and curbing Clyde-st., from Fifth to Ellsworth-ave.

Houston, Tex.—Petitions have been received from several hundred citizens asking that Washington-st. be paved.

Bloomington, Ill.—A petition has been presented to the council asking for an asphaltic pavement in N. East-st.

Asbury Park, N. J.—Ordinances have been passed providing for the grading and graveling of Seventh, First and Fifth-aves.

Philadelphia, Pa.—An ordinance has been passed authorizing the paving of Berks-st., from Sixteenth to Seventeenth, with asphalt.

New Castle, Del.—The city council is considering the advisability of paving Delaware-st., if not this year, possibly next spring.

Baltimore, Md.—Mayor Latrobe has approved the ordinance for grading and paving Baker-st., from Fulton-ave. to the Liberty road.

Trenton, N. J.—An ordinance has been passed authorizing the paving of Agnes-alley, from Mead-st. to Olden-ave., with granite blocks.

Newark, N. J.—Notices of intention have been published for the proposed grading and curbing of S. Seventh-st., and flagging the sidewalks.

Elizabeth, N. J.—Grove-st., from Broad-st. to Washington-ave., will be paved with four feet of trap block pavement on each side, and Telford madacam fifteen inches deep in the center of the street.

Cincinnati, O.—Ordinances have been passed for asphaltic paving as follows: Home-st., from Fourth to Fifth; Gano-st., from Vine to Walnut.

Flint, Mich.—The common council passed an ordinance Oct. 16 declaring it necessary to pave Union-st. with vitrified brick on a concrete foundation.

Nashville, Tenn.—(Special.)—The Tennessee centennial exposition will very soon construct a one-third-mile bicycle track with concrete or asphaltic surface.

Linden, N. J.—Petitions are being circulated asking the township committee to bond the township for the purpose of macadamizing the streets recently decided upon.

Brooklyn, N. Y.—The common council has declared, by resolution, its intention to repave with asphalt Sixteenth-st., Lafayette, Gates and Reid-aves., and S. Third-st.

Neenah, Wis.—The council has under consideration the paving of Wisconsin-ave., from Church to Main-st.; Cedar to Walnut; Commercial, from the bridge to the Menasha line.

Tampa, Fla.—An ordinance has been passed providing that hereafter all sidewalks shall be made of brick, asphalt, cement or some like material, and shall be eight feet in width.

Bloomfield, Ind.—An election in five townships in Greene county Oct. 19 resulted in favor of the construction of fifty-two miles of free gravel roads in the county at a cost of over $120,000.

Camden, N. J.—Petitions have been received by the street committee of the city council for paving as follows: Belgian block, Tenth and Eighth-sts.; assorted rubble, Royden and Carpenter-sts.

Allegheny, Pa.—An election will be held Nov. 5 for the purpose of obtaining the assent of the electors for increasing the city's bonded indebtedness for $400,000 for making additional street improvements.

Spokane, Wash.—An effort is being made to have three miles of a trunk wagon road constructed from the McGuigan creek crossing through McGuigan basin and up to Best basin. Government assistance is being sought to aid in the work.

Rochester, N. Y.—Asphaltic paving is contemplated for Syracuse-st., from North-ave. to Scio-st. First ordinances have been adopted for an asphaltic pavement on Rutger-st., and final ordinances have been adopted for brick paving in Bennett-alley.

Kansas City, Mo.—The common council has passed a resolution declaring the work of paving Forest-ave., from Twelfth to Fifteenth-st., necessary. Trinidad asphalt will be the material. Ordinances have also been approved for paving Charlotte and Washington-sts. with asphalt.

Erie, Pa.—Ordinances providing for the paving of Myrtle-st., from Twelfth to Fifth, with Trinidad lake asphalt have been favorably acted on. The councilmen have decided to settle paving controversies in the future by permitting the property-owners to name the material to be put down, provided the material is first-class.

St. Augustine, Fla.—The property-owners along San Marco-ave. are anxious that vitrified brick be used in paving that thoroughfare, and suggest that if the city cannot afford to pave the width and length of the avenue that about ten feet along the center be paved with brick and the sides filled in with shell, and then the shell can be removed later, if desired, and brick substituted.

Scranton, Pa.—Resolutions were signed recently requiring an estimate for paving Cedar-ave. and Lackawanna-ave. bridges with asphalt, also instructing the city engineer to alter the specifications for paving Clay-ave., to be laid in sheet asphalt from curb to curb, instead of vitrified brick. There is a desire to give brick a test, and as Water-st. is a short one, a number would like to have it paved with brick.

Pittsburg, Pa.—Under the new Flinn act the public works committee has affirmatively recommended ordinances for paving and curbing Friendship-ave., Larimer-ave., Sycamore, Berwich and Tully-sts. Ordinances have been passed authorizing the following: Regrading and repaving DuQuesne-way, from Ninth-st. to Garrison-place; paving and curbing Clyde-st., from Fifth to Ellsworth-ave.; paving Kent alley with irregular block stone.

Memphis, Tenn.—P. C. Powers, street commissioner, has recommended that St. Martin-st., between Beale and Calhoun, be paved with macadam with stone gutters; also that Mill-st., between Main and Chickasaw, be paved with limestone block on gravel foundation; Talbot-st., between Main and Shelby, be macadamized, and the roadway of sundry other streets be graveled. Brick is strongly favored by some members of the city council for St. Martin-st.

Minneapolis, Minn.—The city council has appropriated $70,000 for paving and curbing for next year. As the city pays for one-fifth of the expenses involved, about $260,000 will be available for paving, and it is proposed to have the streets paved early in the season. The streets recommended by the city engineer are: Seventh-st., from Holden-st. viaduct in Oak park, to Seventh-ave.; S. Washington-ave., Third, Fourth, Fifth and Sixth, from Third-ave. north to Fourth-ave. south; Hennepin-ave., from Sixth-st. to Tenth-st.; Nicollet-ave., from Tenth to Grant-st.; First and Second-aves. south, from Washington-ave. to Grant-st.

Jacksonville, Fla.—The city engineer has been instructed to prepare estimates for paving several streets centrally located. The plan is supposed to include the paving, with brick, eventually, of all of the principal streets running east and west from Bay to Duval, and the cross streets between these two, from Market to Julia, as the means at the command of the board of public works shall permit. A report has also been submitted by the city engineer giving estimates for paving portions of different streets with brick. The board of public works has recommended that the proper ordinance be drawn up for paving W. Bay-st. and Riverside-ave. with brick.

New York City.—Commissioner Brookfield has been given permission to pave parts of seventeen streets with asphalt over the present block pavement, aggregating 59,505 yards, at a cost of $238,200. The streets are Sixty-eighth, between Columbus and Amsterdam-aves.; Sixteenth, between Third and Fourth-aves. and Broadway and Fifth-ave.; Thirty-second, between First and Madison-aves.; Eighty-seventh, between First and Second-aves.; Thirty-ninth, between Madison and Fifth-aves.; Forty-third, between Fifth-ave. and New York Central railway tracks; Forty-fourth, between Madison and Fifth-aves.; Seventy-second, between Second-ave. and Avenue A.; Twentieth, between First and Third-aves.; Seventy-first, between Eighth-ave. and boulevard; Avenue A, between Fifty-seventh and Fifty-ninth-sts.; Fourth, between McDougal and Broadway; Mercer, between Fourth and Eighth-sts.; University-place, between Waverly-place and W. Fourth-st., and Washington-place, between Broadway and University-place.

CONTRACTS TO BE LET.

Trumbull, Conn.—Bids are invited until Nov. 4 for constructing a macadam road.

Valley Junction, Ia.—Sealed bids will be received until Nov. 14 for the construction of sidewalks.

Van Wert, O.—C. F. Manship will receive bids until Nov. 9 for grading and macadamizing Walnut and Market-sts.

Tipton, Ind.—Sealed bids will be received until Nov. 2 for the construction of gravel road No. 28. Bond required.

Ft. Thomas, Ky.—Sealed bids will be received until Nov. 6 for constructing artificial stone sidewalks and extending curbing and gutters.

Brooklyn, N. Y.—Sealed proposals will be received until Nov. 1 for repaving Furman-st., from Fulton to Atlantic-ave. Deposit, $650.

Anderson, Ind.—Sealed proposals will be received until Nov. 6 for grading, graveling and curbing Central-ave., from Seventh to Ninth-st.

Rome, N. Y.—Sealed proposals will be received until Nov. 5 for flagging the sidewalk on John-st., between S. James and S. Washington-sts.

Dubuque, Ia.—Sealed proposals will be received until Nov. 2 for macadamizing, curbing and guttering Schiller-ave. and High Bluff-st. Bond, $200.

Baltic, Conn.—Sealed proposals will be received for constructing sections of macadamized and Telford road between Baltic and Hanover, in the town of Sprague, until Nov. 2.

Youngstown, O.—(Special.)—Eugene Kirk writes that the contract will be let, Nov. 1, for macadamizing Wick-ave., from McGuffey-st. to the city limits; also for paving Wood-st., from Wick-ave. to Elm-st.

Cincinnati, O.—Sealed proposals will be received until Nov. 1 for grading and paving with granite blocks Hust alley, from Frintz-st. to Sharp alley; brick, Hust alley, from Sharp alley to McMicken-ave.; asphalt, Dodson alley; granite, Darr alley.

South Bend, Ind.—L. A. Hull will receive bids until Nov. 11 for grading Harper Court, from Vistula-ave. to the St. Joseph river; also grading and paving with brick the first alley west and parallel with Main-st., from Colfax to Water-st.

Huntingburg, Ind.—Sealed proposals will be received until Nov. 4 for grading and paving with brick the sidewalk on the north side of Sixth-st., between Main and Jackson, and on the south side of First-st., between Geiger and Main. Bond required. James Murray, clerk.

Joplin, Mo.—Bids will be received until Nov. 5 for grading and macadamizing Elm-st., from First to C; also Pearl, from Seventh to Ninth, and constructing a drain across the same at Seventh-st. Bids will be received at the same time for a first class sidewalk on Main-st.

CONTRACTS AWARDED.

Scranton, Pa.—The Barber asphalt paving company was awarded the contract for paving Webster-ave.

New London, Conn.—The macadam road on Ocean-ave. will be constructed by Henry L. M. Ladd of Norwich.

Kansas City, Mo.—The Barber asphalt paving company secured the contract for paving Central-st., from Sixth to Ninth.

Columbus, O.—The board of public works awarded the contract, Oct. 7, for paving Parsons-ave. to Owens Bros. at 95 cents.

Williamsport, Pa.—The Sicilian asphalt company secured the contract for paving with asphalt W. Fourth-st., from Elmira to Campbell.

Depew, N. Y.—The contract for macadamizing and curbing Transit-st. was awarded, Oct. 12, to Brown & Stabell of Buffalo, N. Y.

Lockland, O.—The contract for constructing a stone walk on Carthage-ave. was awarded to Glover Perin of Bond Hill, O., for $546.85.

Cicero, Ill.—The town board awarded contracts, Oct. 14, to Delese & Shepard of Chicago for paving S. Willow and Clark-aves. in Austin.

East Hartford, Conn.—The contract for building a new macadam road at the north end of the town has been awarded to W. H. Olmstead, city.

East Chicago, Ind.—(Special.)—Rexford Bros., Blue Island, Ill., have been awarded a contract for macadamizing in this city at $4.02 per lineal foot.

Albany, N. Y.—T. Henry Dumary, city, secured the contract for granite pavements in Clinton, Arch and S. Ferry-sts. Work will not begin until next spring.

Collingwood, Ont.—The Silica Barytic stone company, Ingersoll, was awarded the contract for 25,000 square feet of pavement on the main street of this city.

Rockville, Conn.—The contract for paving Market-st., from the railroad station to Main-st., with Monson granite, has been awarded to James Fitzgerald of Rockville.

Naugatuck, Conn.—The Westerly concrete company, Westerly, R. I., secured the contract for laying a concrete pavement on Hillside-ave. at 56 cents per square yard.

Omaha, Neb.—The contract for paving the intersection of Sherman-ave. and Locust-st. with asphalt, class C, was awarded to Hugh Murphy at $2.07 per square yard.

Madison, Wis.—The contract for laying new asphalt sidewalks in the state capitol park was awarded to the J. H. Marden company of La Crosse, for $1.24½ per square yard.

Waterford, Conn.—The selectmen received one bid for the proposed new macadam highway, and that was from the Bridgeport construction company at $1.61 per running foot.

Middletown, N. Y.—Orr Bros. were awarded the contract for paving as follows: Wickham-ave., Catskill shale brick on concrete, $1.67; Main-st, Catskill shale brick on concrete, $1.79.

Washington, D. C.—The contract for paving D-st., northwest, between Fourteenth and Fifteenth, was awarded to the Eastern Bermudez asphalt company at $1.42 per square yard.

Hamilton, Ont.—The Guelph granolithic company's offer to put down two sample blocks of sidewalk in King and James-sts. from Hughson to King William, at 14 cents per square foot, was accepted.

Niagara Falls, N. Y.—The Park paving company was awarded the contract Oct. 5 for furnishing brick to pave between the tracks of the Niagara Falls and suspension bridge street railway on Main-st.

Kansas, Ill.—Bids were received for constructing gravel roads as follows: C. M. Paxton, Kansas, East road, one and one-quarter miles, 67 2-3 cents per cubic yard; Smith road, one and one-half miles, 57½ cents per cubic yard.

St. Joseph, Mich.—(Special.)—Albert A. Potter writes that the paving contract was awarded Sept. 20 to Thomas J. Peters of Chicago. Clinton brick will be used. Including curbing and grading, the contract will amount to about $11,250.

Streator, Ill.—Contracts have been awarded Sam Smith as follows: Paving Illinois-st., between Hickory and Main, with pressed brick for top course. 90 cents per square yard; N. Bloomington-st., $1.05 per square yard, and 35 cents per lineal foot for curbing.

Cedar Rapids, Ia.—Henry Besler was the only contractor who presented a bid for brick paving Oct. 9, although several other contractors were present with their bids, but did not file them. Mr. Besler's bid was as follows: No. 1 Galesburg brick on macadam, $1.21; stone curbing, 48 cents; excavation, 25 cents.

Dunkirk, N. Y.—(Special.)—J. K. MacDonald, city engineer, says that bids were received Sept. 17 for brick and telford macadam pavement on eight different sections from five contractors, the bids ranging from $1.30 to $1.65 per square yard for brick on concrete foundation, and from $1.22 to $1.35 per square yard for telford macadam paving.

Denver, Col.—The board of public works awarded the contract for paving Court-place to F. O. Blake & Co. The contract was originally awarded to the Colorado paving company as the best bidder, but

the mayor refused to approve the contract for the reason that under the charter all contracts must be let to the lowest reliable and responsible bidder.

Albany, N. Y.—Paving contracts were awarded Oct. 7 as follows: Granite block, Canal-st., from Lexington-ave. to Robin-st., T. Henry Dumary, $12,899.80; Arch-st., from Grand to S. Pearl, T. Henry Dumary, $7,728.80; Clinton-st., from Arch-st. to Fourth-ave., and S. Ferry-st., from S. Pearl to Broadway, Callanan road improvement company, $15,545.80, and $14,599.75 respectively.

Louisville, Ky.—Contracts were awarded Oct. 16 for paving twelve streets with vitrified brick as follows: John R. Gleason, sections of Maple, Sixteenth, Seventeenth, Twentieth and Preston-sts., and Garland-ave.; L. R. Figg, Griffiths, Charlton, Goss and Benton-sts.; Urban, Stengel & Son, H-st., and alley, from Camp to first alley south of Oak; Henry Bickel, Twenty-second-st.; Thompson Bell, brick sidewalks on Catherine-st., between Sixth and Seventh.

Brooklyn, N. Y.—(Special.)—N. P. Lewis, engineer of local improvement, says that bids were received Oct. 2 for asphaltic paving on eight streets and seven intersections. At these intersections where there are street car tracks the space between tracks and rails is to be paved with vitrified brick. The exceptionally low price for asphalt on Remsen and Second-sts. is explained by the fact that these two streets are now paved with Belgian blocks, which became the property of the contractor. All the other streets are paved with cobblestones, which also go to the contractor, but have little or no value. The bids are: Seven intersections, Cranford & Co., brick gutters, $2.25 per square yard; asphalt pavement, $1.50 per square yard; new curb, 70 cents per lineal foot; old curb redressed, 30 cents per lineal foot; concrete foundation, $4.75 per cubic yard; reflagging, 3 cents per square foot. Remsen-st., Fruin-Bambrick construction company, brick gutters, $1.59; asphalt paving, $1.59; new curb, 70 cents; old curb redressed, 30 cents; concrete foundation, $4.35; reflagging 5 cents; Brooklyn Alcatraz company, $2.25, $1.35, 65 cents, 27 cents, $4.18, 5 cents; Cranford & Co., $2.25, $1.15, 70 cents, 30 cents, $4.25, 3 cents; E. J. McKeever & Bro., $1.80, $1.14, 95 cents, 1 cent, $4, 5 cents. Decatur-st., Brooklyn Alcatraz asphalt company, $1.54, 65 cents, 27 cents, $4.18, 5 cents; Cranford & Co., $1.27, 70 cents, 30 cents, $4.35, 3 cents. Sixth-ave., Brooklyn Alcatraz asphalt company, $1.35, 65 cents, 27 cents, $4.18, 5 cents; Cranford & Co., $1.27, 70 cents, 30 cents, $4.20, 3 cents. Second-st., Brooklyn Alcatraz asphalt company, $1.35, 65 cents, 27 cents, $4.18, 5 cents; Cranford & Co., $1.15, 70 cents, 30 cents, $4.25, 3 cents; E. J. McKeever & Bro., $1.06, 95 cents, 1 cent, $4, 5 cents. Schermerhorn-st., Brooklyn Alcatraz asphalt company, $1.79, 65 cents, 27 cents, $4.18, 5 cents; Cranford & Co., $1.55, 70 cents, 30 cents, $4.30, 3 cents. Clark-st., Fruin-Bambrick construction company, $1.59, 70 cents, 30 cents, $4.35, 5 cents; Brooklyn Alcatraz asphalt company, $1.40, 65 cents, 27 cents, $4.18, 5 cents; Cranford & Co., $1.27, 70 cents, 30 cents, $4.35, 3 cents. St. Marks-ave., Brooklyn Alcatraz asphalt company, $1.54, 65 cents, 27 cents, $4.18, 5 cents; Cranford & Co., $1.27, 70 cents, 30 cents, $4.20, 3 cents. Putnam-ave., Fruin-Bambrick construction company, $1.54, 70 cents, 30 cents, $4.35, 5 cents; Brooklyn Alcatraz asphalt company, $1.54, 65 cents, 27 cents, $4.18, 5 cents; Cranford & Co., $1.27, 70 cents, 30 cents, $4.20, 3 cents.

SEWERS.

Thomaston, Conn.—The village will be sewered by a private corporation.

Monticello, Ill.—The work of construction on the new sewerage system began Oct. 7.

Amesbury, Mass.—The need of a sewerage system is more apparent at this time of the year than any other.

Alliance, O.—L. E. Chapin, Canton, O., is preparing plans and specifications for a new sewerage at Fairmount home.

Geneva, N. Y.—E. W. Herendeen has been elected president of the sewer commission, which was organized Oct. 3.

Macon, Ga.—There remains but about five miles more to build of the sanitary sewers and it is thought it will all be completed by Jan. 1, 1896. It will be one of the finest systems in the South.

Worcester, Mass.—The joint standing committee on sewers of the city council, together with Harrison B. Eddy, Rufus B. Dodge, jr., D. A. Harrington, George S. Hatch, J. J. Flaherty and Daniel Boyden, visited Natick and Brockton Oct. 11 to inspect the filtration plant.

Reading, Pa.—A delegation consisting of Edward Chamberlain, city engineer; Col. H. H. Hammer, city clerk, and Amos H. Beard, John M. Fitch, P. J. L. McKinney and George Roming of the sewer commission, visited Wilmington, Del., to inspect the size and connections of pipes, to overlook the entire system and to learn about rates.

Washington, D. C.—Estimates have been made by the engineer department for sewer work during the coming fiscal year, which are as follows: Cleaning and repairing sewers and basins, $50,000; replacing obstructed sewers, $25,000; main and pipe sewers and receiving basins, $93,000; completing the construction of sewers, $271,764; suburban sewers, $639,269; Tiber creek and New Jersey-ave., high level intercepting sewer, $100,000.

Jamestown, N. Y.—A system of sewers, extending through thirty miles of streets and practically covering the thickly populated portion of the city, has been completed. No provision has been made, however, for sewage disposal other than emptying the sewers into the outlet of Chautauqua lake at a point below the city line, with the result that the property owners and residents along the banks of the outlet have protested and an injunction has been secured which temporarily forbids the residents from using the sewers.

CONTEMPLATED WORK.

Passaic, N. J.—(Special.)—A sewer will be constructed in Hobart-st. this fall.

Los Angeles, Cal.—An ordinance has been passed authorizing the issue of $40,000 sewer bonds.

Sharon, Pa.—The city council has decided to bond the town for $16,000 for a complete sewerage system.

Cleveland, O.—A sewer will be constructed in Rutland-st., from Kinsman-st. to a point 750 feet west.

Pittsburg, Pa.—Ordinances in the council provide for sewers in Rowan and Jeannette-sts. and Modoc alley.

Eufaula, Ala.—(Special.)—Engineer's plans are wanted for a sewerage system. Address P. B. McKenzie, chairman.

Reading, Pa.—The authorities contemplate a change from the old system of surface drainage to the underground plan.

Glenville, O.—A special election will be held on the question of issuing bonds for the construction of a sewerage and water works system.

Cooperstown, N. Y.—The state board of health has approved the plan to place a sewer pipe along the lake front at a cost of about $1,800.

Bridgeport, Conn.—The sewer committee of the common council agreed, Oct. 4, to appoint a commission to take charge of the new sewer.

Ellsworth, Me.—E. B. Cummings, Portland, and L. B. Wyman, city, have completed the sewer survey for this city and are now making plans.

Chicago, Ill.—Bernard J. Mahoney has been appointed chairman of the executive committee to provide sewerage and a better water supply for Lake View.

Niagara Falls, N. Y.—The common council adopted, Oct. 15, the recommendation to extend a portion of the sewerage system in the vicinity of the power company's lands.

Ukiah, Cal.—An ordinance was passed Oct. 3 empowering the city council to hold an election to determine whether or not the city should be bonded for $25,000 to construct a sewerage system.

Kansas City, Mo.—The board of public works approved, Oct. 12, the ordinance to continue the extension of the O. K. creek sewer to Belt Line-ave. The ordinance has gone to the common council.

Liberty, N. Y.—(Special.)—Messrs. Wise & Watson, Passaic, N. J., have completed plans for a sewer system which call for intermittent downward filtration. The plans have been approved by the New York state board of health.

Newark, N. J.—Ordinances have been ordered to a third reading to provide for a twelve-inch pipe sewer in Wallace-st., from Bank to Cabinet, and a ten-inch branch sewer in Wallace-st., from a point 100 feet northerly from Bank-st. Notice of intention is also published for pipe sewers in Ogden-st., Lincoln park, Pennsylvania-ave. and Brunswick-st.

Indianapolis, Ind.—Resolutions have been adopted for a main and intercepting sewer in the first alley east of Talbott-ave., from Fourteenth to Seventeenth-st., east to Central-ave., north to Bedford, east to College, north to Sutherland, northeast to Twenty-first, east to Grandview, north to Twenty-second, with a branch in Sixteenth-st., running from this sewer to a point 1,200 feet east.

Greenville, S. C.—The city board of health reported against a petition received from the Sampson and Poe mills to run sewerage pipes from other villages into Reedy river in the flats above Theron Earle's place, expressing the fear that the result of running sewerage into the river at that point would be injurious to the health of the city. The council voted, however, to request the state board of health to send a competent agent to inspect the conditions and report on the probable effects.

CONTRACTS TO BE LET.

Waterbury, Conn.—Bids will be received until Nov. 6 for the Vine-st. trunk sewer and branches.

Dunkirk, N. Y.—Proposals will be received until Nov. 5 for the construction of tile sewers.

Eufaula, Ala.—Bids will be received until Nov. 5 for sanitary sewers. P. B. McKenzie, mayor.

Crawfordsville, Ind.—The contract will be let Nov. 2 for a drainage ditch in Montgomery county.

Toledo, O.—Sealed proposals are invited until Nov. 11 for constructing cylindrical brick and pipe sewers. Bond, $50.

Sandusky, O.—Sealed proposals are invited until Nov. 4 for the construction of sewers in Pearl-st. Guarantee, $500.

Champaign, Ill.—Sealed bids will be received until Nov. 15 for constructing a system of sanitary sewers. Cash deposit or certified check, $1,000.

Waterbury, Conn.—Sealed proposals will be invited until Nov. 6 for the construction of sewers and appurtenances through private property.

South Bend, Ind.—L. A. Hull will receive sealed proposals until Nov. 11 for a pipe sewer on Carroll-st., from sixty-six feet nofth of Wayne to Jefferson; Carroll-st., from the Lake Shore & Michigan Southern railroad to Wayne-st.

Norwood, O.—W. E. Wichgar, clerk, will receive bids at the office of J. M. Harper, corner Ninth and Plum-sts., Cincinnati, until Nov. 9 for the construction of sewers in sub-district No. 1 of main district No. 3. Certified check, $1,000.

Toledo, O.—Sealed proposals will be received until Nov. 4 for constructing a cylindrical brick sewer in the alley southeast of Locust-st.; cylindrical pipe sewer along the center line of Boody-st. and the alley between Segur-ave. and Jervis-st. Cash deposit of $50 on each bid.

CONTRACTS AWARDED.

Pontiac, Mich.—The new sewers will be constructed by Peterson & Co. for $16,373.

Fremont, Ia.—L. E. Heffner, city, secured the contract for laying tile on Main-st., at $1 per rod.

Morrellville, Pa.—The contract for laying 820 feet of sewer was awarded to Hite & Co. of Clearfield.

Cincinnati, O.—The contract for the Conroy-st. sewer was awarded to P. Murray & Son, for $3,092.70.

Sheboygan, Mich.—J. J. Post & Co. was awarded the contract for building the Taylor-st. sewer for $347.50.

Northampton, Mass.—The contract for the lower main street sewer was awarded to Dwight H. Parsons of Westfield.

Lynn, Mass.—Thomas Hurley was awarded the contract for constructing sewers in Summer, River and Ida-sts., for $3,143.75.

Rochester, N. Y.—John Mauder of this city was awarded the contract for the South-ave. pipe sewer for $1,400.

Scottdale, Pa.—Ulrick, Nissley & Williams, Springfield, O., secured the contract for sewer construction in this city for $13,649.80.

Kingston, N. Y.—The contract for building sewers in the Second and Ninth wards was awarded to Campbell & Dempsey, for $51,258.

Paterson, N. J.—The contract for building sewers in E. Thirty-first-st. and Madison-ave. was awarded to Joseph Puglia of this city.

Rutland, Vt.—Bianco & Grimaldi, Cambridgeport, Mass., secured the contract for building 3,250 feet of six and eight-inch sewers, with four-inch sub-drains.

Moorhead, Minn.—The contract for sewer construction in this city, which was awarded to Rinker & Hoff of Minneapolis, has been sublet to J. Kennedy of Fargo, N. D.

Fargo, S. D.—The contract for the Ninth-st. sewer was awarded to C. H. Parritt of this city at 82 cents per lineal foot for sewers and $35 each for manholes.

Boulder, Col.—J. J. Fleetwood & Co., Denver, Col., was awarded the contract for building the sewerage system in this city. The sewer will be 4,280 feet in length.

Albany, N. Y.—John Doyle secured the contract for laying pipe sewers in Broad-st., from Third-ave. to Schuyler-st., for $1,700.70, and in High, from State-st. to Madison-ave. for $2,912.41.

Seattle, Wash.—The contract for the Lenora-st sewer was awarded to C. J. Erickson of this city for $2,965, and George B. Kittenger secured the contract for a sewer in Pennington-ave. for $1,612.08.

East Chicago, Ind.—(Special.)—Rexford Bros. of Blue Island, Ill., have been awarded the contracts for constructing two sewers in this city, at $1.27 for the pipe sewers, and $2.81 for a three and one-half foot, two ring brick sewer.

Ft. Wayne, Ind.—The contract for constructing sewers in the Fifth ward and the alley between St. Mary's-ave. and Oakland-st., and in the alley between Winter and Lilly-sts., was awarded to Mr. Oetting of this city.

Nashville, Tenn.—The Nashville plumbing company secured the contract for constructing a branch sewer in the alley between High and Summer-sts. for $740.15, and one across Harrison-st., between Summer and High, for $76.80.

New Haven, Conn.—Sewer contracts have been awarded as follows: Orange-st. from Trumbull to Audobon, Brazos & Son, $966; York square and York square place, J. B. Whitby, $1,426; Warren-place, from State-st. to Cedar Hill-ave., $427.

Salt Lake City, Utah.—(Special.)—C. M. Dull, secretary board of public works, says that bids were opened Oct. 9 for the construction of 8-inch pipe sewers on Fourth North-st., between First West and Center-sts., about 1,300 lin. ft. The contract was awarded to J. W. Sullivan of this city for $1,261.74. Mr. Sullivan was awarded on the same day the contract for the construction of the flush tank for the gravity outlet sewer for $1,798.50. Bids were received Oct. 14 for the use of sewage at the outlet of the gravity outlet sewer, including the use of 75 acres of land belonging to the city. C. M. Owen of this city bid $10,000 for the five-year term, $12,500 for the ten-year term and $15,000 for the twenty-year term. The contract was not awarded.

Scranton, Pa.—The contract for constructing lateral sewers on Capouse-ave., between Marvin and Green Ridge-sts., and in Irving-ave., to Hart & Gibbons at $1.74 and $2.59 per lineal foot respectively. W. H. Lindsey, Plymouth, Pa., has also been awarded the contract for sewer outlets.

Cambridge, Mass.—Bids were received Oct. 12, for constructing the stone relief sewer at Waterhouse-st and Massachusetts-ave., as follows: John F. O'Brien, $22,695; Dennis F. O'Connell, $21,601.98; Dennis O'Connell, $19,771; T. H. Byrne & Co., $19,286.25; A. W. Byrne, $18,799.25; Metropolitan construction company, $17,680.10.

Altoona, Pa.—(Special.)—Harvey Linton, city engineer, says that the contracts for vitrified clay pipe sewers have been awarded as follows: To Bowman Bros., McKeesport, Pa., Third-ave., between First and Thirteenth-sts., 2,380 lineal feet eight-inch pipe, 44 cents; ninety-three Y branches, 50 cents; 900 lineal feet ten-inch pipe, 50 cents, forty-six Y branches, 50 cents; 420 lineal feet twelve-inch pipe, 55 cents, twenty Y branches, 70 cents; 1,236 lineal feet fifteen-inch, 65 cents; sixty-two Y branches, 75 cents; three air inlets, $10. To William H. Herr, Altoona, Pa., Third-ave., Twenty-third-st., Third alley, Fourth-ave. and Fourth alley, 1,356 lineal feet eight-inch pipe with fifty-seven Y branches, 802 lineal feet ten-inch pipe with twenty-nine Y branches, and four air inlets, aggregating 2,158 feet, at 41 cents per foot.

Detroit, Mich.—Contracts for lateral sewers were awarded Oct. 18 as follows: Julius Porath, alley between Beaubien, Antoine, Medbury and Harper, $169; alley west of Van Dyke, between Jefferson and Richardson, $487; alley between Shiphard and Van Dyke, north of Champlain, $385. John Wagner, alley between Beaufait, Bellevue, Warren and Frederick, $750; between Richmond and Champlain, west of Van Dyke, $400; between Concord, Canton, Stewart and Canfield, $550. George Jaynes, alley between Wabash, Thirteenth, Linden and Grant, $159; Commonwealth-ave., between Grand Trunk railway and Piquette, $686. J. A. Mercier & Co., alley between Mt. Elliott, Meldrum Charlevoix extended and Berlin, $100. August Koss, alley between Townsend, Baldwin, Forrest and Warren, $860. John Jaynes, alleys between Scotten and La Salle, north of Buchanan, $367.

Far Rockaway, N. Y.—Bids were received Oct. 14 for sewer construction as follows: Sheets & Hammond, Urichsville, O., $28,708.38; P. T. Plunkitt, Jersey City, N. J., $29,157.10; Manhattan supply company, $30,433.35; P. H. Harrison & Sons, $30,988.95, both of New York; Fell & Co., Orange, N. J., $31,786.50; John Marsden, Utica, N. Y., $31,416; Norton & Dolton, New York, $32,653.40; James Caffery, Far

Rockaway, N. Y., $33,523.95; N. Honan & Sons, Chester, Pa., $33,839.75; Thomas McCormick, New York, $34,302.20; Holmes & Hogan, Jersey City, $35,313.60; Headley & Christie, Newark, $35,357.05; Harris Bogert, Brooklyn, $35,671.20; W. W. Cook, Clinton, N. Y., $35,689; G. W. Ruch, Philadelphia, $35,810.10; Smith & Brennan, New York, $36,182.25; Thomas McCann, Brooklyn, $37,993; Essex & Hudson Construction company, Newark, $38,444; Cortwright & Kenelon, Mt. Vernon, $39,145.50; Mike Sandro, Niagara Falls, $38,917.40; Stratford & Hawkes, Brooklyn, $41,771.60; Smith & Berden, Long Island City, $44,247.65; Smith & McCormick, Easton, Pa., $46,483.80; DeWitt C. Bouker, Brooklyn, $47,362.35; Joseph A. Flynn, New York, $48,187.35; George P. Alcott, Orange, N. J., $50,133.95; Murray & Molloy, New Rochelle, N. Y., $50,447.05; Bernard & Mohan, Brooklyn, $52,157.07. Pipe: McNeil Pipe and Foundry company, Burlington, N. J., $19.65. Castings: M. J. Drummond, N. Y., $21, $30; Warren Foundry, Philipsburg, N. J., casting, $21.44, $22.30; J. Howard Bing, New York, $33.33; E. B. Hawkins, New York, $24.99; Mills & Ferguson, Hoboken, N. J., $37.50.

WATER-WORKS.

Galesburg, Ill. (Special)—M. J. Blanding, city engineer, says that thirty four-inch tubular wells have just been completed in the extension of the water works system, and 6,000 feet of six, eight and sixteen-inch water mains laid.

Chicago, Ill.—The residents of the north and northwest sections of the city have appointed a committee to confer with the drainage board to learn what plans have been adopted for the drainage of the north branch of the Chicago river. P. F. Haines is chairman.

Escanaba, Mich.—At a special election held a few weeks ago the issue of $50,000 worth of bonds was authorized for the construction of a water works plant, but the question of the present franchise, which is owned by an eastern corporation, and which runs twenty years from 1886, threatened to interfere with the proposed plant. That the present service is inadequate and not what the franchise calls for has been proven in a test made Oct. 15, and the city will take steps to nullify the franchise.

CONTEMPLATED WORK.

St. Augustine, Fla.—A standpipe and receiving reservoir will be erected.

Akron, N. Y.—The citizens have voted in favor of a water works system.

Pittsfield, Mass.—The question of a water supply continues to be the prime object of discussion.

Greenville, Miss.—(Special.)—New plans will be drawn by an engineer for a system of water works.

Fort Worth, Tex.—The city council has voted to issue $12,000 bonds to extend the water works system.

Hyattsville, Md.—A committee will probably be selected to go before the next legislature and request it to grant authority to issue bonds for about $20,000 for water works.

Detroit, Mich.—W. H. Ashwell & Co. have completed plans for a system of water works for the Log Cabin subdivision.

Eufaula, Ala. — (Special.) — Engineers plans are wanted for an enlarged water works plant. Address P. B. McKenzie, chairman.

Atlantic City, N. J.—The city water commissioners have applied to the city council for permission to issue $225,000 of bonds for the improvement of the water system.

Water works will be voted for at the following places: Elyria, O., Nov.; Pomona, Cal, Nov. 9; Middletown, O., Nov; Bellevue, Pa., Nov; Monroeville, O., Nov.; Paducah, Ky.; Juniata, Pa.; Columbus, Wis.

Duluth, Minn.—The city council has passed two ordinances, one to issue bonds to the amount of $1,000,000 to build a new water plant at once, and one to establish a city water works department to have five commissioners and a secretary.

Lafayette, La.—T. M. Biossat, chairman, and John J. Bell, secretary of the committee appointed by the Business Men's association and city council to consider means for establishing a water works and electric light plant, have opened correspondence with contractors for estimates on the proposed improvements.

CONTRACTS TO BE LET.

Manteno, Ill.—Sealed bids will be received until Nov. 8 for a new water works system.

Honey Brook, Pa.—Proposals are invited until Nov. 10 for a gravity system of water works.

Chenoa, Ill.—Sealed proposals will be received until Nov. 4 for the whole or any part of the water works pipe line.

Eufaula, Ala.—Bids are invited until Nov. 5 for survey for water supply and plans and specifications for water works. P. B. McKenzie, mayor.

CONTRACTS AWARDED.

Grove City, Minn.—Fairbanks, Morse & Co., St. Paul, secured the water works contract for $5,185.

Royal Center, Ind.—Stevens & Bedwards presented the lowest bid for constructing the water works system, $6,250.

West Carthage, N. Y.—The contract for the water works system was awarded to A. F. Nims of Philadelphia, for $11,600.

Grand Junction, Colo.—The contract for building the new water works system was awarded to W. F. McCue, for $11,730.

Philadelphia, Pa.—The Pennsylvania asphalt paving company presented the lowest bid for altering the Queen Lane reservior.

Le Sueur, Minn.—C. F. Loweth, St. Paul, has been engaged to superintend the construction of the water works and electric light plant.

Watertown, Wis.—The Watertown water works company hag been granted a franchise for the water works system, the works not to cost over $100,000.

Canton, Miss.—(Special.)—A contract has been signed for the completion of water works within four months. The name of the contractor is not stated.

BRIDGES.

Atlanta, Mich.—A bridge is contemplated across the Thunder Bay river.

Des Moines, Ia.—A bridge is contemplated for the Raccoon river in W. Fifth-st.

Okawville, Ill.—A bridge will be built across the Kaskaskia river two miles north of here.

Allison, Ia.—Bids are invited until Nov. 5 for constructing wooden or pile bridges in Butler county.

Beatrice, Neb.—H. T. Ward & Co. secured the contract for the five county bridges for $3,389.

Carbondale, Pa.—The plans and specifications for the new bridge at Eighth-ave. are completed.

Buffalo, N. Y.—The Buffalo engineering company has been assigned the plans for a bridge at Porter-ave.

Rochester, Pa.—The Ohio river bridge company has been authorized to construct a bridge over the Ohio river.

Parkman, O.—The county commissioners will place a wide track bridge across Grand river at the grist mill.

Jackson, Mich.—The Jackson bridge and iron works secured the contract for the Columbus-st. bridge at $1,795.

Bloomington, Ill.—The bridge across Salt fork, in Creek township, will be replaced by an iron bridge at a cost of $5,000.

Lincoln, Neb.—The north side viaduct ordinance became a law Oct. 14. Bonds to the amount of $200,000 have been voted.

Bay City, Mich.—Bids will be advertised at once for building a bridge across the Saginaw river at the McGraw farm, near this city.

Bridgeton, N. J.—Cox & Sons' company city, secured the contract for building a new bridge over the Cohansey, at Broad-st., for $14,746.

Logan, O.—The county commissioners have awarded to the Columbus bridge company the contract for a 125-foot span bridge for $1,425.

Vermillion, S. D.—Miles Russell has been canvassing the town for signers to a petition for an iron bridge across the Vermillion river.

Rochester, N. Y.—The city engineer has been directed to prepare plans for the construction of a foot-bridge across Deep Hollow, at Emerson-st.

Davenport, Ia.—The business men have agreed to subscribe $50,000 for the bridge to span the Mississippi river from this city to Rock Island.

Astoria, Ore.—The contract for building the draw pier bridge across Young's bay was awarded to Dickinson & Co. of Tacoma, Wash., for $20,000.

Hillsdale, Minn.—The contract for building a stone arch bridge across the Rollingstone river has been awarded to Charles Butler for $1,340.

Carlton, Col.—A state bridge has been located across the Arkansas river. The state legislature has appropriated $5,000 and the county will donate $3,000.

Sevierville, Tenn.—The Schultz bridge and iron company, Pittsburg, secured four contracts for steel bridges in Sevier county, the cost aggregating $10,650.

Topeka, Kas.—The board of county commissioners will submit to the voters Nov. 5, the question of raising $150,000 by loan, for building the Kansas-ave. bridge.

Fairmount, Minn.—The contract for constructing a bridge over the outlet between Sisseton and George lakes was awarded to S. M. Hewitt & Co. of Minneapolis.

Galesburg, Ill.—(Special.)—M. J. Blanding, city engineer, says that the bridge across the Cedar Fork creek, on Academy-st., has been completed, at a cost of $2,000.

Delaware, O.—The contract for constructing a bridge across the Olentangy river, east of Norton, was awarded to the Bellefountaine bridge and iron company for $4,250.

Atlantic City, N. J.—A new steel promenade, from forty to forty-eight feet wide and extending from Massachusetts to Florida-aves., is contemplated, at a cost of $150,000.

Denver, Colo.—The Wrought iron bridge company of Canton, O., was awarded the contract for constructing a steel bridge over White river, in Rio Blanco county, near Rangely, for $3,825.

Houston, Tex.—Sealed bids will be received until Nov. 4 for the construction of an iron draw bridge across Buffalo bayou, connecting Marsh and Hill-sts. Certified check, $1,000; bond, $5,000.

Allegheny, Pa.—The Keystone bridge company will do the structural iron work and Booth & Flinn the street work, changing of grade, etc., in the reconstruction of the California-ave. bridge.

Abbeville, La.—Proposals are invited until Nov. 15 for constructing a steel swing bridge, 170 feet draw span, eighteen feet roadway, over Vermillion bayou. W. N. Edwards, chairman bridge committee.

Iola, Kas.—James Wakefield, county clerk, will award the contract Nov. 9 for building an iron or steel bridge across Big creek. Bids for the stone substructure will be received on the same day.

Lenape, Kas.—An election will be held in November to decide upon the construction of a bridge over the Kaw river at this point, jointly between Johnson and Leavenworth counties. The bridge will cost $16,000.

Greenfield, Mo.—The contract will be let Nov. 5 for building an iron bridge across Sac river, about six miles north of Everton; also, a contract to build two stone abutments. Bond required. Ben Freedle, road and bridge commissioner.

Sterling, Colo.—A delegation from Atwood waited upon the board of county commissioners Oct. 8 and presented a petition for a bridge across the river at that point. The matter was taken under consideration.

Little Rock, Ark.—Judge Compton of the county court has appointed Hon. J. A. Woodson and W. W. Dickinson bridge commissioners for the proposed free bridge. Plans will be adopted and bids advertised immediately.

Cincinnati, O.—Sealed proposals will be received until Nov. 2 for the new superstructure over Lee's creek, on Biddinger road, in Harrison township, including raising of abutments and making necessary approaches. Henry Korb, president.

Sauk Rapids, Minn.—The village council is discussing the advisability of beginning legal proceedings against the county to compel it to rebuild the Mississippi bridge, which was partially destroyed by a severe storm a few weeks ago.

Alexandria, S. D.—Sealed bids will be received until Nov. 9 for constructing and completing upon stone piers and abutments a wood, iron, or combination bridge of two spans, 54 and 66 feet each, with a sixteen-foot roadway across the James river at Rockport.

Detroit, Mich.—The township boards of the townships of Springwells and Ecorse returned the bids to all parties, except Keeper & Thacher, who filed with the clerk a certified check for $1,000 for building the iron bridge on the river road across the Rouge river.

Decatur, Ill.—Mandamus proceedings have been brought against the road commissioners to compel them to make the county line bridge across the Sangamon, between Macon and Piatt counties, safe. A new bridge is needed, as repairing the old one would be practically useless.

New Orleans, La.—Sealed proposals will be received until Nov. 4 for removing the existing iron bridge at Carrollton-ave. and New Basin to Adams-st. and New Basin, and constructing a new iron bridge at Carrollton-ave. and New Basin. Deposit, $250; bond, 33 1-3 per cent. of estimated value of the contract.

Cleveland, O.—The plans for the proposed new bridge over the old river bed at Willow-st., and which will probably be built next year, provide for a structure 290 feet long, not including approaches. It will be of pivot truss style, one span being 170 feet long and the other 120 feet long. The total cost will probably reach $100,000.

St. Paul, Minn.—The outlook for a new bridge this year at Raymond-ave., St. Anthony's park, is not very encouraging. The citizens of St. Anthony want an iron bridge, but in case they cannot have it they will consent to a wooden bridge. Accordingly, a resolution has been adopted instructing the city clerk to advertise for an iron or wooden bridge.

St. Louis, Mo.—Plans were outlined at a meeting of the railroad committee of the St. Louis manufacturers' association, Oct. 15, for building a free bridge across the Mississippi river. The committee have under consideration the applications of three engineering firms who desire to bid on the construction of the bridge. A third bridge is believed necessary over the Mississippi to accommodate the heavily increasing tarffic each year.

Chicago, Ill.—Mayor Swift's plan for a viaduct to connect the boulevards provides for a viaduct from Rush-st., or some other convenient street north of the river, to Michigan-ave. and Randolph-st. The mayor's plan is favored. A resolution has been adopted to the effect that it is inexpedient to connect the subject of a viaduct from Michigan-ave. to the north side with the subject of the Lake Front park.

Rochester, N. Y.—The Wrought Iron bridge company, Canton, O., has completed the Emerson-st. lift bridge. It is 114 feet long with eighteen-foot driveways, and two sidewalks six feet wide each; two arched iron girders, one on either side of the driveway, reaching from end to end of the bridge. This bridge is probably the coming type of bridge for the streets in this city, where lift bridges are required.

Paterson, N. J.—The Oswego bridge company received contracts as follows: Little Falls-st., widening the bridge over Peckham stream, near Ryle park, $720; building an iron bridge near Jackson's and taking down the wooden structure, $919; Straight-st, widening the sidewalk at one end of the bridge, $470; Richard Stanley secured the contract for removing the bridge across the Oldham brook at Rip Van Winkle-ave. to Roe-st. and building a new bridge at Rip Van Winkle-ave. for $2,123.

PARKS.

Kansas City, Mo.—A macadamized boulevard between Kansas City and Olatha has been suggested.

Le Sueur, Minn.—The city council has arranged for the purchase of a site for a park, which will be known as Stewart park.

St. Augustine, Fla.—The site for the proposed station and water tower will be surrounded by ornamental grounds and used as a city park.

Cleveland, O.—The executive committee of the board of directors of the Little consolidated street railway decided to expend $10,000 for improving Scenic park at Rocky river.

Cleveland, O.—A map has been made of the proposed conversion into a boulevard of Lake-ave. and extending it to Rocky river. The roadway will be 100 feet wide and will be macadamized. Work will begin next spring.

Pittsburg, Pa.—The South Pittsburg board of trade favors the acquisition of several small parks which will be easily accessible to the people, thinking more good will be derived than would be by having one large park.

Cedar Rapids, Ia.—A new athletic park containing twelve acres, five of which will be laid off into base ball grounds, and seven for a bicycle track, foot ball grounds and other track and field sports, will soon be established at a cost of about $7,000.

St. Louis, Mo.—Plans have been formulated for constructing three seventy-foot boulevards through Tuxedo park, improving other streets and having street car connections. The Tuxedo park company, owners of Tuxedo park, has increased its capital from $40,000 to $75,000.

Greenfield, Mass.—A number of business men met recently to formulate plans for establishing a stock company to control a new pleasure park. Plans for the park were shown by George W. R. Harriman, R. H. Oakham, J. W. Stevens, F. E. Lowe, W. F. Allen, W. H. Snow, W. E. Wood and W. G. Packard were appointed a committee to inquire further into the matter.

Detroit, Mich.—Mayor Pingree will shortly recommend to council the establishment of a permanent agricultural park. His plan is to purchase a tract of land of about 100 acres and rent it in small tracts at a nominal rate per year, and the rent in fifty years would pay for the land.

Detroit, Mich.—An early meeting will be held to discuss in all its details the proposed new boulevard that is to extend from the John Owen park to Grosse Point, along the river and lake front. Dr. E. C. Skinner, George M. Hendrie and Charles H. Seitz are promoters of the boulevard.

Seattle, Wash.—E. O. Schwageri, park commissioner and landscape architect, recently outlined the plan for the inauguration of a boulevard system, which provides for a belt boulevard of generous width and arrangements, embodying a spacious driveway, cycle way, walks, electric car line and traffic roads, each placed in proper relations to the others and separated by ample areas of platted lawn.

Los Angeles, Cal.—The necessary signatures of the property owners along the line of the road have been obtained for the proposed boulevard from West lake to Elysian park. G. A. Fudicker, who has made a proposition to the city council, suggests that the lines of the boulevard be from Elysian park to the south side of Echo park, thence to Alvarado, thence on Alvarado to Westlake.

Chicago, Ill.—The Fourth ward council sent in a resolution Oct. 17 favoring the establishment of small parks through the thickly populated portions of the city. An ordinance had been approved by which Humboldt park will be connected with Lincoln park by way of Diversey-st. This proposed boulevard will give the city a connected park system of more than thirty miles. The west park board has accomplished a great improvement between Douglas and Garfield parks in the construction of a new asphalt and macadam boulevard, three-quarters of a mile long and 250 feet wide.

MUNICIPAL BONDS.

London, O.—Bids are invited until Nov. 8 for $15,000 worth of electric light bonds.

Youngstown, O.—Bids will be received until Nov. 1 for $20,000 worth of street improvement bonds.

Allegheny, Pa.—Whann & Schlesinger, New York City, purchased the $650,000 worth of water bonds for $689,292.50.

Duluth, Minn.—Bids are invited until Nov. 1 for the purchase of $1,000,000 worth of 4 per cent. water and light bonds. Certified check, $10,000.

Peoria, Ill.—The park bonds were sold to E. H. Gay & Co. of Chicago. The total amount is $200,000. The Parkplace paving bonds, $4,000, were sold to A. J. Bailey at $1.35.

New Paynesville, Minn.—The bid of Farson, Leach & Co. of Chicago was accepted for the $5,000 water works bonds, it being an offer of par and accrued interest and a premium of $188.

Columbus, O.—Sealed proposals are invited until Nov. 20 for the purchase of $22,000 worth of street improvement bonds; also $38,000 worth of improvement bonds. Interest 4½ per cent.

College Hill, O.—F. R. Strong, village clerk, will receive bids at the office of E. F. Layman, 32 E. Third-st., Cincinnati, until Nov. 18 for ten bonds aggregating $1,859.76. Interest 6 per cent.

STREET CLEANING.

CHICAGO, Ill.—Since the street cleaning committee began its work 175,000 feet of street and alley frontage have been cleaned a month at a cost of $4,800, or about 2¾ cents per foot. Harry G. Selfridge, who has been at the head of the committee in charge of the work, recommends that some form of independent association be organized to continue the cleaning through the winter. It is estimated that $50,000 is needed for the operating expenses for the rest of the year.

STREET LIGHTING.

Holden, Mo.—An electric light plant is contemplated.

Hicksville, N. Y.—A petition is being circulated for electric lights.

Buck's Harbor, Me.—An effort is being made to secure an electric light plant.

Eufaula, Ala. — (Special.) — Engineers' plans are wanted for an electric light plant.

Arcanum, O.—Sealed bids will be received until Nov. 6 for a franchise for an electric light plant.

STREET SPRINKLING.

Newton, Mass.—The mayor is of the opinion that the only way to secure properly sprinkled streets, so that the roadways would be actually preserved and not damaged, is for the city to own the necessary plant. He recommends for 1896 the purchase of at least a few watering carts in order that a beginning may be made in the proposed plan of improved service.

TOO LATE FOR CLASSIFICATION.

Monroe, Mich.—Better sewers are being agitated.

Albany, N. Y.—A new intake pipe is needed.

Chillicothe, Mo.—A brick pavement is contemplated on Locust-st., between Jackson and Clay.

St. Marys, O.—Sealed proposals will be received until Nov. 14 for a water works system.

Atlanta, Ga.—The city council has authorized the water board to purchase an additional water main.

Ottawa, Ont.—A petition is being circulated for a new bridge across the canal at Bank-st.

Mobile, Ala.—Bids will be received until Nov. 20 for erecting three steel bridge spans and approaches.

Clay Centre, Kas.—Bids will be received until Nov. 4 for building pile bridges across Quinby and Cain creeks.

Cato, N. Y.—A single span iron bridge is contemplated over the Seneca river, between Weedsport and this city.

Cleveland, O.—Mayor McKisson has authorized plans prepared for a bridge across the railroad tracks at Seneca-st.

Williamsport, Md.—A bridge is contemplated across the Potomac river between this city and Berkeley county, W. Va.

New Orleans, La.—Bids will be received until Nov. 14 for constructing an iron bridge across the New Orleans navigation canal.

Lockport, Ill.—Proposals will be received until Nov. 7 for furnishing and laying a new system of water mains, hydrants, valves, etc.

St. Thomas, Ont.—James A. Bell, city engineer, is preparing plans for a new sixty-foot steel bridge to replace the bridge at Glencolin.

Muskegon, Mich.—The board of supervisors will consider at their meeting in January the proposition to bond Muskegon county for improving the roads.

Joliet, Ill.—An ordinance will be prepared for macadamizing Richards-st., from Washington-st. to Hickory creek, and paving the gutters with brick or cobblestone.

Maquoketa, Ia.—Sealed proposals will be received until Nov. 2 for building a county bridge of two spans and approaches.

Quincy, Ill.—Hiram Phillips, C. E., St. Louis, Mo., has been decided upon by the special sewer committee to draw plans for the sanitary sewer system.

Mansfield, O.—The question of issuing $40,000 worth of bonds for establishing sewage disposal works and extending the sewerage system will be voted upon Nov. 5.

Hamilton, O.—Bids will be received until Nov. 12 for erecting a swing bridge over the Miami and Erie canal at the Franklin road junction, Middletown.

Philadelphia, Pa.—A steel bridge with a thirty-foot driveway and ten-foot sidewalks will probably be constructed over Lansdowne Glen in Fairmont Park during 1896.

Braiden Town, Fla.—Bids will be received until Nov. 5 for constructing a bridge across the Miakka river at a point where Mitchellville and Pine Level road crosses said river. H. F. Wyatt, auditor.

Jacksonville, Fla.—The three lowest bidders for terra cotta sewer pipe are the Lookout sewer pipe company of Chattanooga, the Union sewer pipe company of Akron and W. A. Bisbee of this city. The contracts will be awarded Nov. 15.

Milwaukee, Wis.—Much surprise was occasioned Oct. 22 by the Prospect-ave. committee recommending cedar block pavement for that thoroughfare. City Engineer Benzenberg is greatly opposed to the scheme, believing that it is a step backward in the city's progress.

Youngstown, O.—The board of city commissioners has under consideration again the plan of building an overhead bridge from Belmont-ave. to Federal-st. and from Federal-st. across the river. This bridge has been talked of for some time.

Vermillion, S. D.—Bids will be received until Nov. 11 for constructing a 144-foot Bent bridge across the Vermillion bridge in place of the Airline bridge; also for a 240-foot Bent bridge across the river in place of the Russell bridge.

Chicago, Ill.—The Assyrian asphalt company's bid for paving W. Madison-st., from Jefferson-st. to Center-ave., was $1.96 per square yard for paving and 6 cents a running foot for plastering. The Barber asphalt company's bid was $2.12 for paving and 20 cents per foot for plastering.

Dunkirk, N. Y.—Bids will be received until Nov. 5 for furnishing material and constructing a stone arch bridge over Crooked brook, on Brigham road, between Fourth and Fifth-sts. Bids will be received the same date for furnishing the material and enlarging the stone culvert across Railroad-ave., between Wight and Talcott-sts.

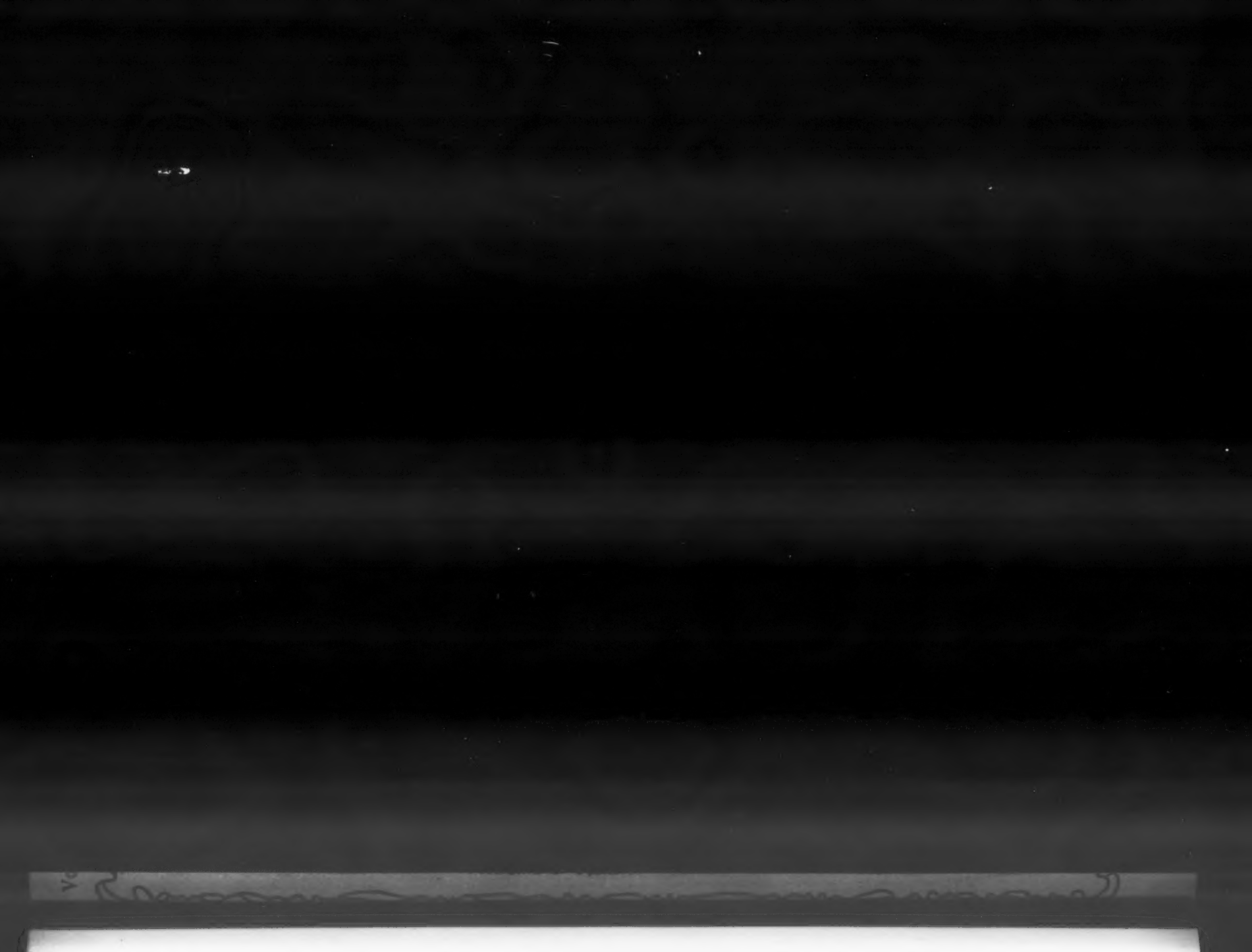
Brooklyn, N. Y.—Bids were submitted Oct. 21 for asphaltic paving on Cambridge place, Quincy, Dean and Macon-sts. and Russell-place. Cranford & Co.'s bid was the lowest on three streets and the Eastern Bermudez company's on two, each being $1.25 per square yard. Other competitors were the Fruin-Bambrick construction company and the Brooklyn Alcatraz company.

Boise City, Idaho.—Sealed proposals will be received until Nov. 16 for the removal of the two north spans of the bridge now crossing the south channel of the Boise river, near Star, and rebuilding same at a point about 400 feet east of the bridge built across the north channel of the Boise river, near Star.

The Best Asphalt Comes from the Trinidad Asphalt Lake

THERE are different kinds of asphalt, just as there are different kinds of cement, wood, stone or other commonly used materials. Some are good, and some are wholly unfit for use; there is only one kind that ranks as THE BEST; that is the Trinidad Lake Asphalt. It is recognized and specified by the best authorities as the standard asphalt. Many of the best governed cities will not permit any other kind of asphalt to be used. Why should they when the other kinds are inferior in quality and there is little difference in the cost? —well, yes, there is a difference—the inferior kinds cost very much the most in the end. The man who buys cotton clothes instead of woolen goods makes neither a wise nor economical choice. A worse mistake is made in using inferior asphalt. A substantial evidence of the superiority of Trinidad Lake Asphalt Pavements is found in their record, which shows that they have been longest in use, have been the most satisfactory, and have worn the best. No other asphalt pavements in American cities have a record of eighteen years' use.

View of Trinidad Pitch Lake, from a point about 300 feet west of Central Lake. Bushes at the left are islands.

The company which has probably laid more Trinidad Lake Asphalt pavements than any other is the Barber Asphalt Paving Company. It is a remarkable fact that no Trinidad Lake Asphalt pavement laid by this company has ever been replaced by any other form of pavement, but on the other hand the Barber Company has replaced other pavements with Trinidad Lake Asphalt to the extent of 3,009,864 square yards, of which 150,799 square yards were other kinds of asphaltic material.

Besides the superiority of the material itself, there is a guarantee of Trinidad Lake Asphalt pavements in the fact that the companies which lay these pavements are required to be strong enough, financially, to meet any responsibility. Experience in the leading American cities has demonstrated two things as incontrovertible facts: First, that asphalt pavements have more of the desirable qualities than any other kind; second, that the best asphalt pavements are those made of *Trinidad Lake Asphalt.*